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Plaster Molds for Intaglio Work

How to Cast Statuary and Undercut Work

Written for The Metal Industry by EDWARD D. GLEASON, Foundryman

In a previous article in THE METAL INDUSTRY,* I set forth the method of making precision castings finished to an accuracy of .004", using a composition of water, plaster paris and asbestos in certain proportions.

In the formation of the molding sand within the drag and cope of a flask in general foundry practice, a pattern of the object to be cast is usually pressed into the sand, but where the pattern with its surface more or less in intaglio, or under cut, it is both difficult and sometimes impossible to withdraw the pattern from the sand without breaking down the walls of the mold. Such a pattern is set forth in Figure 1.

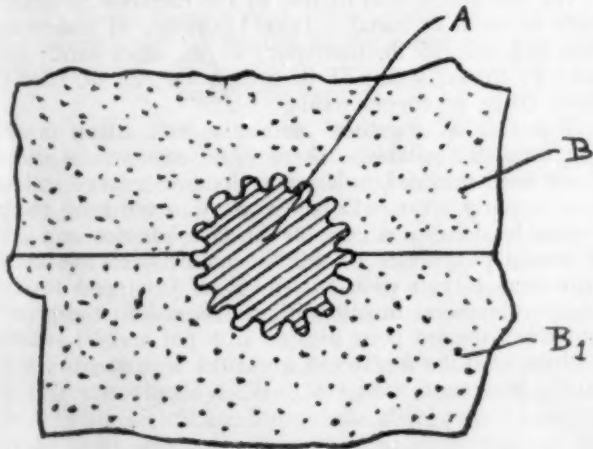


FIG. 1. A REPRESENTS AN END SECTION OF A FLUTED COLUMN; BB, THE MOLD.

This difficulty heretofore has been overcome by the use of false cores entailing the services of skilled workmen known as false core makers; consuming an immense amount of time and labor at prohibitive prices; involving the loss of time and greatly decreased production. A man may work on a job six weeks or more, and lose it through a defective casting, and where it consists of high grade art work the loss may involve thousands of dollars.

It is the purpose of this article to show in a simple

manner, how with the use of plastic molds, a great variety of work in intaglio can be accomplished, regardless of the design. A simple pattern will suffice for our purpose, namely that of a fluted column. We proceed by first making in wood the opposite of the fluted column in an accurate half core box. These should be made accurately, so that when the two halves are together they will match accurately. A casting is then made from this wooden



FIG. 2. AN END SECTION OF A HALF CORE BOX OF THE COLUMN.

pattern, using half tin and half zinc, and which has very little shrinkage. It is then scraped and finished so as to present a smooth surface. These particular flutes could be milled accurately from the solid metal, but it should be understood there are thousands of designs for art work in its many ramifications, which must first be carved or worked out in wood, the same as any design is sunk in steel. If it is a face or a figure, the reverse is made the same as in the fluted column.

There are in every city certain craftsmen who make gelatine molds and follow the art of making images of plaster paris. Where the work is in intaglio and fine details and contours, they invariably employ gelatine molds in which the image has been made. The composition of plaster paris is poured into this mold and when set, is by stretching and manipulation removed from the tough and rubber-like mold. Being of such a consistency and of a yielding nature, it is "pulled" from any under cuts or intaglio work in the design. These craftsmen will make you a gelatine mold from your metal patterns regardless of the design and from this gelatine mold will pour the composition from which the plastic molds are made. The plastic molds consist of 7 parts plaster paris and three parts asbestos, and are easily removed when

*See our issue of October, 1921, pages 391-393.

made and set. This composition is then baked and dried for 10 hours at a constant heat of from 800° F. to 1000° F., preferably in a gas oven free from any other work.

Taking for granted that these requirements have been complied with, we will now make a pattern in two halves conforming to the outside measurement of the two halves of the plastic molds containing the design. This pattern is then rammed up in a silica sand mold and baked hard. The cope and drag containing the wooden pattern will appear in section in Figure 3.

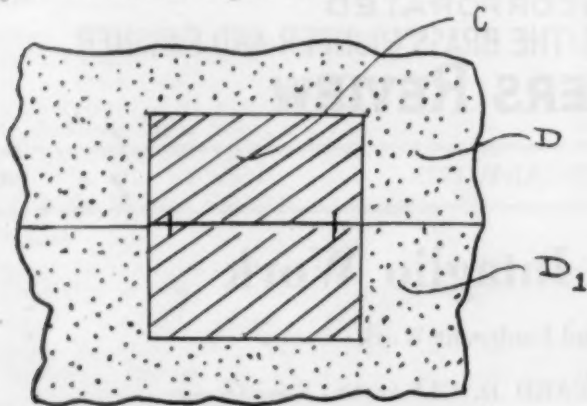


FIG. 3. C IS THE PATTERN IN TWO HALVES WITH DOUBLE PINS; DD IS THE MOLD

When the pattern is removed the finished mold baked will appear as in Figure 4.

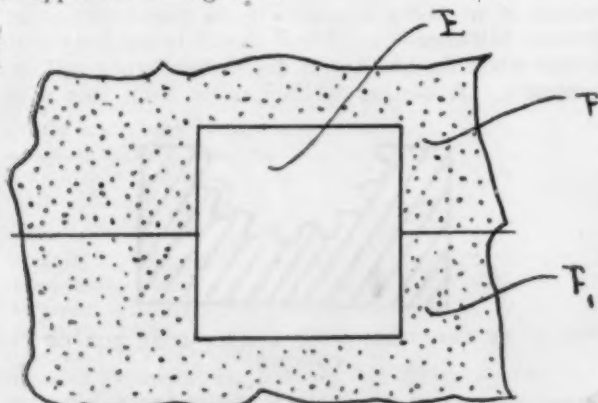


FIG. 4. E IS THE PRINT IN WHICH IS SET THE PARTS COMPOSING THE PLASTIC MOLD PROPER; FF₁ IS THE MOLD WHICH ACTS AS A HOLDER FOR THE PLASTIC PARTS

This mold can be used over and over if the work is in production. The mold for the hot metal is the composition of plaster and asbestos, and as it can only be used once, it is readily seen that the intaglio of the mold proper does not count as it is broken and removed to get the finished casting which is the opposite from the die or design. Also, all work produced in the gelatine molds is fac-simile of the die or pattern. These pieces when set in the mold appear as in Figure 5.

The mold is now clamped together and is ready for the pouring. Pour from the end, using a mixture composed of 66 parts copper, 32 parts zinc, 1½ parts tin and ¼ part of aluminum. This mix has about the color of statuary bronze, but it should be understood that you cannot pour bronzes in these molds. Any copper base alloy high in zinc can be used; also aluminum, tin and zinc base alloys. You will get a casting that is finished and as smooth as glass.

Anyone who can melt and pour hot metal can produce

a class of art work in intaglio of endless designs that is beyond the skill of any sand molder and includes the combined work of the sculptor and modeler. This is only accomplished by the use of plastic and gelatine molds.

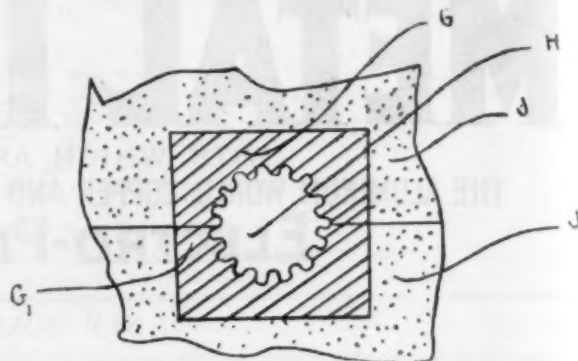


FIG. 5. JJ₁ IS THE BAKED MOLD; GG₁ ARE THE PLASTIC PIECES; H, THE DESIGN OF THE FLUTED COLUMN.

These molds and the plastic parts entering into their make-up should be kept in a drying oven until used as any moisture is detrimental to their success. Where core work is necessary, sand can be used.

Reclaiming Polishing Sweepings

Q.—Will you please send me a book telling how I can remelt bronze sweepings from a polishing room. I have a furnace and crucible and I tried it, but it all turned to dirt. I have about two ton of bronze sweeping with a small amount of aluminum in it.

A.—There is no book that specializes on remelting bronze sweepings from a polishing room. There are, however, books that will help you understand the nature of smelting, such as *Metallurgy of Non-ferrous Metals*, by Gowland, and *Metals and their Alloys* by Vickers.

We can advise you of one of the methods of reducing such material to metal. Take 1,000 lbs. of your sweepings and add 25 lb. fluorspar; 25 lb. silica sand; 25 lb. salt; 35 lb. sal soda; 75 lb. iron scale; 25 lb. hard coal dust; 10 lb. of copper oxide.

Mix this all together—and mix well. Run down in any furnace available. There is no economy in running down such material, unless it is done on a large scale and in a properly arranged reverberatory or reducing furnace. It can be done in a crucible furnace but not at a profit. It would pay better to sell the material to the smelter. However, if you wish to try it, all you need to do, is charge the metal mixed with the flux into the crucible, and when melted pour into an iron pot and let settle for a while. All the metal will go to the bottom and the slag can be broken off the metal.—W. J. REARDON.

Piston Ring Metal

Q.—We are planning to manufacture piston rings out of some soft metal which would stand forming and yet give the desired service in a cylinder. The pressure against the cylinder walls will be approximately 3 to 4 lbs. per square inch bearing surface; wear of the outside diameter of the ring should not exceed .0015 per 1,000 miles running of the motor, which, of course, increases the opening in between the ends to about three times that amount per 1,000 miles. What metal could be used?

A.—We would suggest a phosphor bronze mixture such as is used for springs, etc. If you will write any of the brass mills, they will be able to furnish you with such material.—W. J. REARDON.

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Sand Casting Monel Metal

Hints for the Foundryman Who is Casting This High Nickel Alloy*

The practice used in making sand castings of Monel metal is similar in some respects to steel foundry practice and in some other respects to iron or brass foundry practice. The melting practice, also the gates and risers necessary for feeding, are very much like those for steel. The extreme care in moulding and ramming more nearly resembles that for the non-ferrous metals. The shrinkage is very great ($\frac{1}{4}$ -inch to the foot). Cores must be collapsible to allow free shrinkage of the metal. The pouring temperature required for Monel metal is high (2800° F.). The metal dissolves carbon and will dissolve it in melting. It will also absorb sulphur from furnace atmospheres, which is injurious to the metal.

In making sand castings from Monel metal, special attention must be given to the behavior of the metal in the furnace or crucible, as well as in the mould. Careful attention to details is essential to the production of sound, tough metal, free from shrinkage cavities, as well as to avoid the tendency to hot cracking in large or complicated castings and to get a surface free from burned-in sand.

MATERIALS

Metal supplied by The International Nickel Company for foundry use:

MONEL METAL SHOT GRADE "D"

Nickel	not less than 60.00%
Copper	not less than 23.00%
Iron	not more than 3.50%
Manganese	1.00-2.00%
Silicon .....	.25-.75%
Carbon	not more than .25%

Good castings can be made using up to 40 per cent of foundry scrap, such as sink heads, risers, etc. Foundry men should avoid indiscriminate purchase of secondary material (Monel metal scrap). The quality of your castings depends upon the quality of the metal you put into your furnace.

MELTING PRACTICE

Monel metal can be melted successfully in graphite crucibles, using oil-fired pit furnaces, in oil-fired clay brick lined reverberatory furnaces, and in clay brick lined or basic lined electric arc furnaces.

The use of coal or coke-fired crucible pits is not recommended since the time required for melting is excessive and there may be difficulty in attaining a sufficiently high temperature. However, this practice has been used successfully.

The melting time in the best oil-fired crucible pit furnace will vary from one and a half to two and a half hours. In an electric arc furnace the charge can be melted down in from one to two hours. The experience of the International Nickel Company is that the oil or gas-fired crucible furnace is best for the production of castings to withstand hydrostatic pressure.

The quality of fuel used, as far as its sulphur content is concerned, is an important point. Only low sulphur fuels should be used if success is to be expected. When fuel oil is used it should not contain over one-half of one per cent sulphur. The metal actively absorbs sulphur from furnace gases. It is necessary, when melting Monel metal, whether in crucibles, reverberatory or electric furnaces, to protect the metal as far as possible from contact with the furnace gases. Crucibles must be kept covered,

and in the reverberatory furnace a blanket of slag should cover the metal from start to finish.

In the reverberatory and electric furnaces, but not when melting in crucibles, a little charcoal, added with the charge (about two pounds to one hundred pounds of metal), should be used in melting down, to keep the metal from oxidizing. Melting should not be prolonged beyond the time required to reach the necessary temperature, but it is essential to have in the metal sufficient heat (about 2800° F.) to cover loss in heat while getting metal from furnace to mould. Unless this is watched the metal is liable to show cold sets or misruns.

DESIRABLE COMPOSITION

In foundry practice it is necessary to control the Manganese, Silicon and Carbon. A desirable composition of these elements for the general run of castings is:

Manganese	1.00 to 2.00%
Silicon .....	.25 to .75%
Carbon .....	.10 to .25%

A higher silicon content is desirable when increased fluidity is necessary to make thin sections. Silicon also adds strength and increases the hardness of the metal. The tendency to hot shortness, however, increases with high silicon and is decreased by high manganese. The silicon and manganese contents may be obtained by the use of ferro-silicon (best practice use a 90 per cent silicon) and ferro-manganese (best practice use an 80 per cent manganese). These additions should be made after melt-

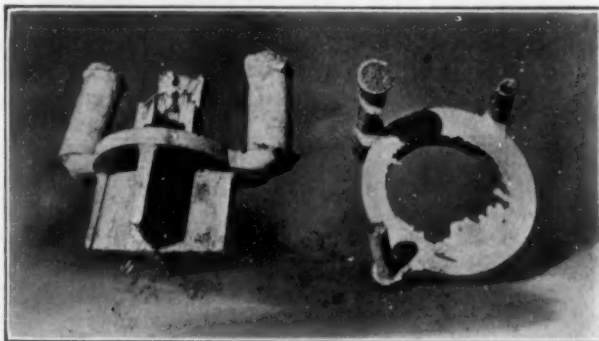


FIG. 1. GATES AND RISERS ON SIMPLE MONEL CASTINGS

ing down, shortly before pouring. Immediately after making the ferro-silicon and ferro-manganese additions when using a reverberatory or electric furnace, the metal bath should be poled for five or ten minutes. For this purpose a pole of wood that is still green should be used. The furnace should then be sealed and the temperature brought up to the tapping temperature above mentioned; namely 2800° F. This will take about one-half hour. If working in a crucible, immediately after making additions the metal should be stirred quickly with a Monel metal (or iron) rod. Practice must be so controlled as to avoid formation of graphite carbon in the metal, which makes it brittle. This is liable to take place above .25 per cent total carbon and it is therefore, well to stay considerably below that figure.

All ladles or crucibles used for transferring metal should be pre-heated to conserve heat in the metal.

The metal should not be skimmed clear before pouring. Slag and dross should be carefully held back with a skim-

*From The International Bulletin, No. 121.

ming rod. Special care should be taken to pour only clean metal into the mould.

DEOXIDATION

Deoxidation is accomplished by the addition of one and one-half ounces of stick magnesium per one hundred pounds of metal, added to the crucible or ladle just before pouring. It should be plunged by means of tongs to the bottom of the ladle and stirred vigorously. **Make sure the magnesium reaches all parts of the molten charge.** When melting in crucibles it is desirable to make this addition five minutes before drawing the heat from the furnace. A good test of the success of deoxidation is to pour a small test bar (convenient size $\frac{1}{2}$ -inch x $\frac{5}{8}$ -inch x 12-inch). If the metal has been completely deoxidized this bar, when cold, will bend through 180° on a radius of about $1\frac{1}{4}$ -in. without cracking.

TEMPERATURE

The optical pyrometer will be found more satisfactory than any other type for controlling furnace and pouring temperatures. The Leeds & Northrup (high temperature range) is recommended by the International Nickel Company. When taking stream pouring temperatures or temperatures of free surfaces of molten metal in ladle or crucible, a correction must be added to the observed temperature based on an emissivity of 0.4 for Monel metal:

3000° F.	(Apparent temp.)	add 275° F.	for true temp.
2900	do	275	do
2800	do	258	do
2700	do	241	do
2600	do	225	do
2500	do	212	do

MOULDING

In moulding no general rule can be given as every pattern is a law unto itself. **Sink heads and risers must be placed so as to feed the casting well and suppress shrinkage cavities.** Sometimes it is best to feed the casting directly from the top; in other cases to feed it from the side, but no definite rule can be laid down.

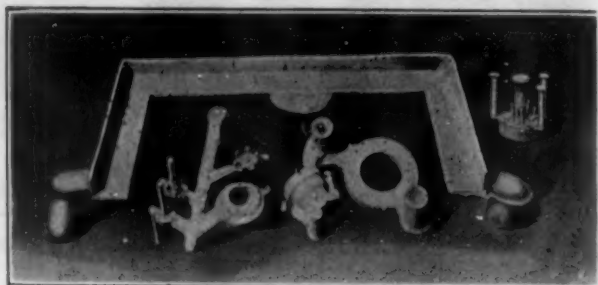


FIG. 2. GROUP OF VARIOUS MONEL CASTINGS

The shrinkage of Monel metal is one-quarter inch to the foot. This characteristic must be kept in mind, especially when moulding large or complicated castings and every chance given the metal to shrink-in without being held by the sand. To fill the casting this shrinkage must be taken care of by ample-feeding through large sink heads and risers. **Special care must be given also in moulding patterns that have abrupt changes in cross section.** Such castings are greatly helped by using chills at heavy sections. Ample fillets should be used, and wherever possible very thin sections should be avoided on account of misruns.

Monel metal is sensitive to gas from binders used with the sand, therefore, binders should be kept down as much as possible. **An open sand should be used.** A typical mixture for dry sand moulding is, by volume, twenty parts

Lumberton, ten parts Silica, and one part Wunderblend binder or its equivalent, wet down with clay water—vent freely. The mould is dressed with plumbago, silica flour and molasses water, mixed together and applied with an air spray or brush, then dried in an oven. If the casting should be a heavy one another coating of dressing is applied, and dried again. Large castings of heavy sections should in all cases be cast in baked moulds.

Small castings may be made in green sand, using a mixture of Nos. 1 and 2 Albany sand, in which case no facing nor mould dressing is used.

Cores are made from washed Silica sand and raw linseed oil, about 25 to 1 for large cores and 60 to 1 for small work. These also should be well vented. Vent wax will be found useful here. Cores are dressed with the same dressing used on moulds.

The important points to watch are:

- 1—Use clean metal—not too much scrap.
- 2—Have the composition right.
- 3—Keep the carbon under 0.25 per cent.
- 4—Do not use poor quality fuel, high in sulphur.
- 5—See that all the metal is deoxidized.
- 6—Have plenty of heat in the metal when pouring.
- 7—Have plenty of metal in sink heads and risers to take care of the shrinkage.
- 8—Give the gases a chance to get away.
- 9—Use chills at heavy sections to produce coincident freezing throughout the casting.
- 10—Give the metal a chance to shrink without being held by the sand.

The practice with nickel very closely follows that for Monel metal.

Removing Aluminum From Solder

Q.—Kindly advise us if you have any method of eliminating aluminum from solder. We receive solder filings from auto bodies which also contain a small percentage of aluminum filings. We would like to know what would be the best method of getting rid of this aluminum.

A.—The only way aluminum can be eliminated from solder is by oxidation, and that is best done in a reverberatory furnace and by the use of iron scale as a flux.

4% Iron Scale	2% Fluorspar
4% Sal Soda	10% Coal Dust
4% Silica Sand	2% Lime

Mix this flux with your solder filings and charge into your furnace. This flux will throw the tin and lead to the bottom and the aluminum and other impurities can be taken off with the slag. Pour your metal received in a slab mold and run through your sweating furnace and all trace of aluminum will be gone.

You may, however, lose some tin and lead in your sweating furnace, but this can be recovered in the next charge.—W. J. REARDON.

Pattern Metal

Q.—What is a light, non-shrinking pattern metal?

A.—A very good non-shrinking metal for pattern work, one that will give the least amount of shrinkage is composed of 55% tin, 44% zinc, 1% Bismuth. This alloy may not be as light as you require, so the light alloy with the least amount of shrinkage is composed of 90% aluminum and 10% silicon. This alloy has less than 1% shrinkage and may answer your purpose. It makes a very nice casting, free from shrinks and cracks and for pattern plate work, gives very good results.—W. J. REARDON.

Aluminum Castings

Some Practical Suggestions

A useful lecture was delivered to the Birmingham (England) Branch of the Institute of British Foundrymen on Nov. 15, 1924 by C. Dicken, foundry manager of Humber Limited, at Coventry, the title of the lecture being "Aluminum Castings." It was distinguished by its practical character, a special feature being the description of a number of alloys now in popular use. T. Vickers, the president of the branch, occupied the chair.

In connection with the rapidly increasing use of aluminum, the lecturer remarked that brass foundries are increasingly making the casting of aluminum a branch of their trade owing to this metal so frequently replacing brass. The metal was growing in popularity not only for the aero and automobile trades but for domestic and electrical purposes. Aluminum was seldom used in its pure state, the elongation being too high and the tensile strength too low. Much general use has been made of the Air Board L5 alloy consisting of 2 to 3 per cent of copper, 12 to 14 per cent of zinc and the remainder aluminum. This was largely used for the making of crank cases, gear boxes, rear axles, etc., having a tensile strength of 10 tons, sand cast and 14 tons chill cast with an elongation of 6 per cent sand cast and 4 per cent chill cast. Another alloy largely used for motor cycle crank cases, gear boxes, etc., consisted of 92 per cent aluminum and 8 per cent copper having a tensile strength of 11 tons per sq. inch and 3 per cent elongation. L11 alloy containing 7 to 8 per cent copper, 1 to 2 per cent of zinc and the remainder aluminum resisted a fairly high temperature and was very

suitable for cylinders or any castings having to stand stress combined with temperature. L8 comprising 88 per cent aluminum and 12 per cent copper, was universally known as piston alloy and was very suitable for castings produced in a permanent mould where elongation was not required. The tensile strength was about 10 tons per sq. inch. A useful alloy was one containing 5 to 13 per cent silicon and the remainder aluminum, which would help to overcome difficulties connected with porosity.

The speaker warned users against the wide variety of aluminum scrap, some of it being the remains of castings made 12 or 14 years ago, often of inferior metal, while a lot of ingots consisted of swarf turnings and sawings of all types of alloyed aluminum. As an example of the result of such purchases the speaker cited the purchase of an ingot which should have weighed only six pounds but weighed 6½ pounds.

Stress was laid on the use of the pyrometer as excessively hot metal caused many wasters. He considered 700° C. the best for most testing. Cores should be released from the casting as soon as possible. A very suitable sand was an ordinary mixture of red and black sand fairly tough, and the best results were obtained with 91 per cent of sand and 9 per cent of water, the mold being faced with an equal percentage of graphite and French chalk. Blow-holes were caused by the failure of gases to escape, an excessive proportion of moisture or a ramming too hard of the molds. The use of damp chills might cause blow-holes.—J. H.

Bending Brass Tubes

Q.—What is the best method to use in bending copper and brass tubes without using a bending machine?

A.—The materials required are two wooden plugs of suitable size for the tube to be bent; a quantity of sharp sand and also a wooden rapper, the same as used by lead workers on lead pipe; a forge or blow torch; also a funnel for pouring sand. First plug one end of the tube with a wooden plug. Insert the funnel into the other end of the tube and pour in sand which must be thoroughly dry and preferably warm. Rap down with a hammer until firm and the tube is full. Remove the tube and insert the other plug. Mark the position of bend and place on forge or apply torch. Heat slowly to just a dull red heat and pull ends to form a bend allowing the latter to form naturally. Offsets may be formed in this manner as short as the diameter of the tube. Care must be taken not to let the tube get too hot or to keep the heat on the tube too long. The shorter the bend required, the shorter the heat on the tube should be kept. Men soon get to be experts at this method and bends are formed very quickly.—P. W. BLAIR.

Threading Pewter

Q.—Can you tell us where we can get threads similar to sample which is being sent under separate cover?

A.—It is impossible to make the screw as per sample, with threading tools because the metal (pewter or tin) is too soft to carry the threading tools and will crumple up during the operation. Would suggest a mold for each of the parts, both molds to be exact duplicates of threads, etc. This metal flows readily into molds as you know. Any good concern, making a specialty of molds, can produce the articles cheaply. Those concerns making pepper and salt tops, tooth paste tubes, etc., would be most adaptable to this work.—W. L. ABATE.

Cement for Porcelain and Brass

The best method for cementing brass parts on to porcelain handles is to use a first-class grade of litharge and mix to the correct consistency with pure glycerin. The powdered litharge should always be kept covered and not exposed to the air. It should be worked up into a plastic or putty form and placed in the hollow part of porcelain, and brass parts inserted, then a weight applied until the litharge sets hard in 30 to 35 minutes. It is not practical to use sulphur or rosin mixed with plaster of paris and fine clay as it will not stand hot water temperature. As an illustration, rosin becomes liquid at a temperature of 212° F., sulphur 235° F.—P. W. BLAIR.

Brazing Imperfect Castings

Q.—Will you kindly tell us whether or not sand holes in cored brass castings can be successfully and economically brazed shut by the use of an acetylene torch?

A.—There is no method that we know of that will braze, successfully and economically, sand holes in brass castings. It would be far cheaper to make the castings over, and try and avoid the cause of the sand holes.—W. J. REARDON.

Aluminum for Salt Water

Q.—What alloy of aluminum will resist salt water?

A.—We suggest a mixture of 98% aluminum, 2% manganese for this class of work. This alloy is as near pure aluminum as can be cast. It is particularly useful to withstand chemical action and has been used around alkalis with very good results.

However, this mixture is very hard to cast and another mixture that is used to resist salt water corrosion is composed of 92% aluminum, 2% copper, 6% silicon. This mixture runs well in the foundry and is said to give very good results.—W. J. REARDON.

Developments in High Frequency Inductive Heating

Ajax-Northrup Furnace Operated From Rotary Electrical Machinery

By DUDLEY WILLCOX

Secretary and Sales Manager, Ajax Electrothermic Corporation, Trenton, N. J.

High frequency currents have been applied to melting and heat treating operations on a laboratory scale for seven or eight years. Commercial installations have been made for producing alloys of nickel-iron, gold-platinum, osmium-iridium and other metals which require high temperatures, freedom from contamination and thorough mixing. High frequency furnaces are also used commercially for melting metals of the tungsten group in graphite containers for producing carbides. Their potential uses are numerous.

The principle of these furnaces is that of a transformer in which the primary is a coil of copper conductor and the secondary is a mass of conducting material within the coil. Many induction furnaces have been designed on the principle of an iron core transformer in which the secondary is a loop of molten metal. They have large

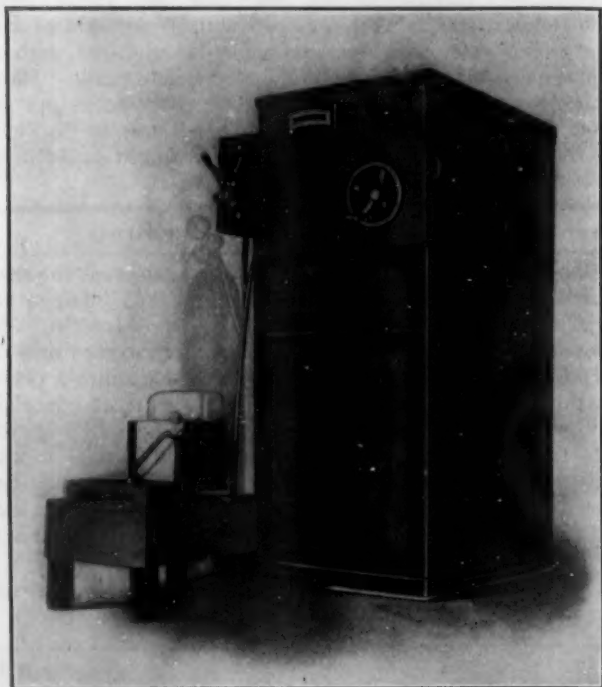


FIG. 1. 20 KW. HIGH FREQUENCY CONVERTER AND SMALL HIGH TEMPERATURE FURNACE INSTALLED IN LABORATORY OF INTERNATIONAL NICKEL CO.

radiating surface and attendant troubles with refractories. The high frequency furnace may have a bath in the form of a cylinder which has small radiating surface for a given volume. The metal bath may be contained in an ordinary crucible. The current in the coil does not heat it much above room temperature, but the mass within the coil is rapidly heated to the melting point and higher, if desired. As in ring type induction furnaces, the metal is stirred by electro-magnetic forces so that thorough mixing of alloys is assured.

The usual form of high frequency current "Converter" consists of a reactance, a step-up transformer, a special form of discharge gap, and a bank of condensers. Current from 60 cycle power lines is changed to oscillatory current having a frequency which is the natural period

of the furnace circuit. A high frequency converter and a small furnace operating from it are shown in Fig. 1.

Fig. 2 shows a high frequency furnace operated from a rotary high frequency generator. Fig. 3 shows the generator driven by a steam turbine operating with 110 lbs. steam pressure. A bank of condensers shown at the right of Fig. 3 serves to correct the power factor of the furnace circuit. In place of the steam turbine an over-

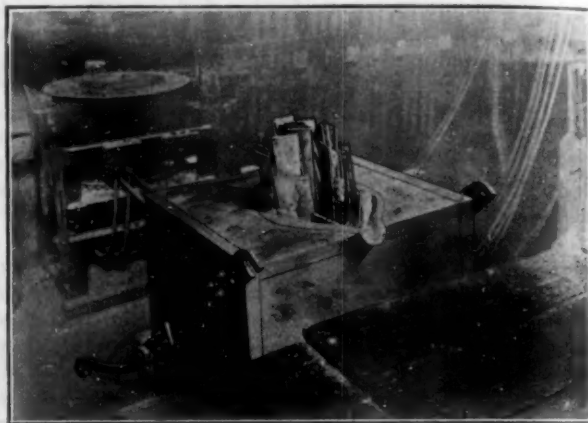


FIG. 2. 600 LB. FURNACE FOR MELTING COPPER AND NICKEL SILVER BY HIGH FREQUENCY INDUCTION. FURNACE AFTER BEING COMPLETELY EMPTIED, MELTS A NEW CHARGE OF 600 LBS. OF COPPER STRIPS, AS SHOWN, IN ONE HOUR AND NINE MINUTES.

size synchronous motor to drive the generator can be used to correct the power factor of the primary power supply lines.

The furnace illustrated has been used for melting nickel-silver and copper, and the stirring effect is pro-

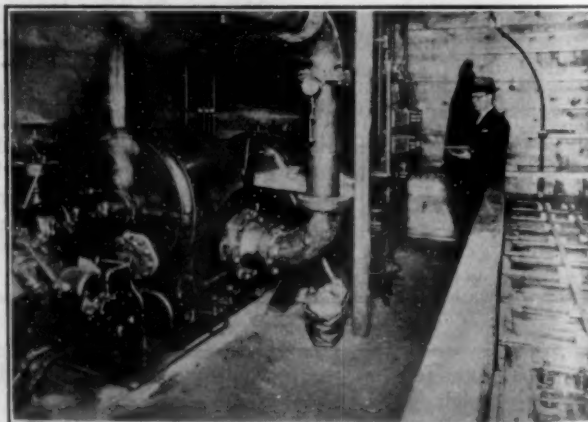


FIG. 3. TURBO-GENERATOR DELIVERING 100 KW. OR MORE OF HIGH FREQUENCY POWER AND CONDENSERS FOR POWER FACTOR CORRECTION FOR FURNACE ILLUSTRATED IN FIGS. 2, 4 AND 5

nounced as in the case of smaller furnaces operated with oscillatory current. Six hundred pounds of copper can be melted in a little over an hour with a power input of about 100 kw.

Figure 4 shows the furnace containing molten copper

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FIG. 4. 600 LB. FURNACE FOR MELTING COPPER AND NICKEL SILVER BY HIGH FREQUENCY INDUCTION.

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FIG. 5. 100 KW. TURBO-GENERATOR DELIVERING HIGH FREQUENCY POWER AND CONDENSERS FOR POWER FACTOR CORRECTION FOR FURNACE ILLUSTRATED IN FIGS. 2, 4 AND 5

over night
case was

being poured into a series of iron molds. The power can be applied during pouring if necessary to keep the contents at the proper pouring temperature. Fig. 5 shows the crucible poured clean except for the charcoal which is used to prevent ozidation of the copper during melting. The following data are interesting as comparisons of

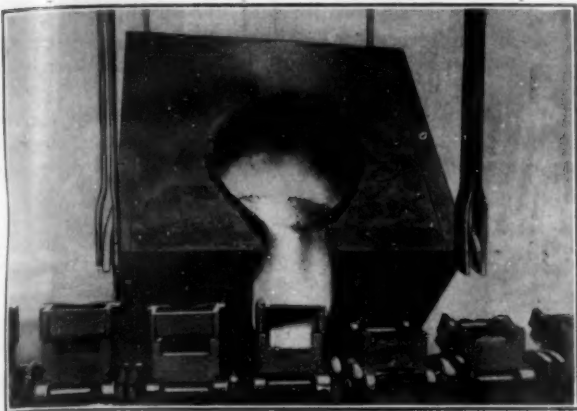


FIG. 4. 600 LB. CHARGE OF COPPER BEING POURED INTO IRON MOLDS.

the efficiency of the furnace in melting different materials and different forms of materials. In the first four cases the material was charged in the form of scrap pressed into "cabbages" and some loose scrap. The fifth melt recorded consisted only of copper strips as illustrated in Fig. 2. The sixth melt was of a solid lump of nickel-silver which had been allowed to freeze in the crucible

silver was melted as recorded in the first line of the tabulation. It is of high practical value that a molten mass may solidify in the crucible and be re-melted without cracking or injuring the crucible.

Another very interesting high frequency furnace installation was made recently at the Westinghouse Electric and Manufacturing Company, in East Pittsburgh. They are melting nickel-iron and silicon-iron alloys in 225 lb.

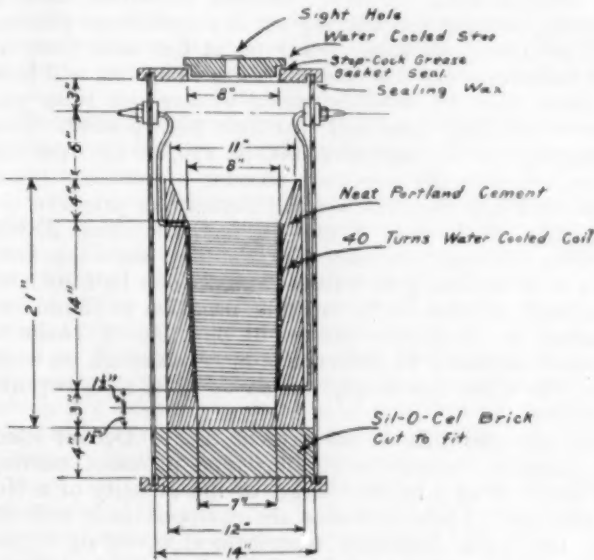


FIG. 6. SECTIONAL DRAWING OF HIGH FREQUENCY NON-POURING FURNACE USED FOR MELTING ELECTROLYTIC IRON AND NICKEL.

AVERAGE READINGS

Crucible	Metal	Pounds	Kilowatt Rate	Time of Melting Hr.	Min.	Total Kw-h. Consumed.	Lbs. Per Kw-h.	Remarks
Cold.....	Nickel-silver.....	636	90.1	1	49	163.8	3.98	.....
Hot.....	Nickel-silver.....	636	92.8	1	18.6	121.8	5.23	.....
Cold.....	Common brass.....	636	99	1	04	105.5	6.02	.....
Hot.....	Common brass.....	636	99.5	1	43	71.3	8.9	.....
Hot.....	Copper.....	636	100	1	09	115	5.53	.....
Cold.....	Nickel-silver.....	600	84.9	1	22	115.70	5.19	Metal in solid lump at start.

(Data on last line taken by E. F. Northrup)

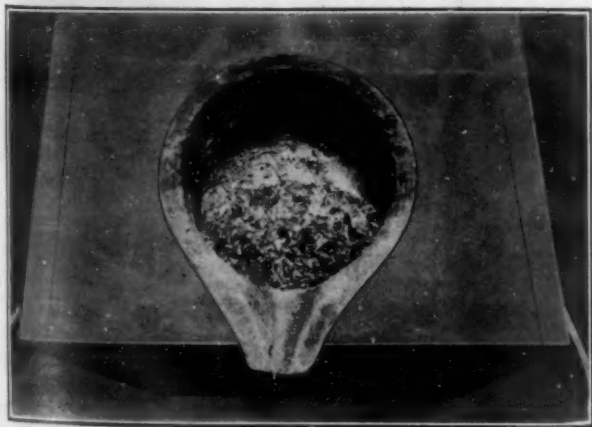


FIG. 5. INTERIOR OF CRUCIBLE IN 600 LB. HIGH FREQUENCY INDUCTION FURNACE, SHORTLY AFTER POURING.

over night. It will be noted that the efficiency in this last case was somewhat better than when cabbaged nickel-

lots—operating their furnaces from a 5000 cycle generator driven by a direct-current motor. The generator is rated at 100 kilowatts and practically the full power is delivered to the furnace circuit. A melt takes less than an hour. The necessity for keeping the carbon content of their alloys to the astonishingly low figure of .006 per cent or less makes it necessary to use a non-carbonaceous crucible. The Zircon crucibles used last only for one heat, but the cost of melting is nevertheless considered low. Some of their melting is done under a vacuum and some under hydrogen. The furnace construction lends itself admirably to either. A section of an early design of the furnaces used in this installation is shown in Fig. 6.

A full technical and economic discussion of the Westinghouse installation is to be presented at the April meeting of the American Institute of Electrical Engineers, by P. H. Brace of the Westinghouse research staff.

All of the furnaces described were made under the patents granted to Dr. E. F. Northrup of Princeton, N. J. These patents are controlled by the Ajax Electrothermic Corporation of Trenton, N. J.

Electric Furnace Practice in the Bronze Foundry

A Description of an Installation of Five Detroit Electric Furnaces*

By F. C. HEATH, Chief Engineer, Federal-Mogul Corporation, Detroit, Mich.

The greatest potential field for the electric furnace is in the medium-sized foundry. In such foundries melting, molding, pouring and shaking out is a continuous process, with all these operations going on at the same time. I will venture to say that any one of our molders will have no more than 16 molds standing at any one time, and from 8 to 12 of these will just have been poured. This means that our tonnage of 23,000 lb. (10,909 kg.) per day is poured with the minimum amount of molding space. This condition requires a small furnace to preserve the flexibility of the coke fires. In fact, the small 250-lb. (110-kg.) furnace is more flexible than the coke fires, since it is necessary to wait no longer than half an hour if a quick change in the melting program is found imperative, as frequently occurs in our line of business. We melt probably 15 different bronzes, although no more than 5 to 6 are run in any one day. This, also, requires flexibility.

We are operating at the present time 5 Detroit Electric Furnace Company's rocking type furnaces, melting 230 lb. (104 kg.) to the charge, or the capacity of a No. 70 crucible. These furnaces are equipped each with its own 100 k.v.a. Kuhlman transformer, operating at an average rate of input of 90 to 100 kw. We originally were equipped with 60 k.v.a. transformers, and produced around 12 to 15 heats per furnace per day. We soon found that brass could be melted much faster, and then changed to the 100 k.v.a. transformer to have plenty of capacity, and our record now stands at 21 heats in one day from one furnace, starting the arc at 6.15 A. M. and finishing the 21st heat at 3.15 P. M.

After the first 2 or 3 heats, which always take more energy than the succeeding heats, the average time of melting was 17 minutes, with a loading and unloading time of 6 minutes, making a total of 23 minutes for the complete cycle. I think I am safe in saying that this is the quickest time that any bronze has ever been melted in production.

The greatest number of heats that I know of being taken out of any one of our coke fires in a day is 6, with a melting time of from 1¼ to 1½ hours. So far, our limiting factor in the speed of melting is the lining. The quality of the bronze is unimpaired by the quick melting, as I will show later. (See Table II.)

The operating advantages are: (1) The human element is largely eliminated and the field for obtaining labor widened; (2) greater uniformity of product, each heat being melted under the same conditions as every other heat as nearly as it is possible to do; (3) the use of the crucible is eliminated, except for carrying metal from the furnace to the molds; (4) everything put into the furnace is melted and taken out, with the resultant low metal loss, according to our two days' test, of 0.6 per cent.

With coke fires, some of the metal is liable to spill out into the coke while charging; pots sometimes leak and sometimes burst in the fire. Foundries vary in their estimate of loss in the coke fire, but in a test that we ran, without any of the accidents which I have enumerated happening, we found a melting loss of 2 per cent.

As I have mentioned previously, linings are the limit-

ing factor in melting. With the rate of input of 75 kw. we had a lining last 2,000 heats, but with the rate of input of 90 to 100 kw., it is not economical to run the lining over 1,000 heats.

The average consumption of electricity per ton for our class of bronzes is 325 kw. hr., with an electrode consumption of 6.5 lb. (3 kg.) per ton. We melt principally:

TABLE I

No.	Copper Per Cent	Tin Per Cent	Lead Per Cent	Zinc Per Cent
1	85	5	5	5
2	85	5	9	1
3	80	10	10	..
4	88	10	..	2

Table II below gives some tests we have made of the physical properties of coke and electrical-fired furnaces on metal analyzing 85 per cent copper, 5 per cent each of tin, lead and zinc.

TABLE II.—PHYSICAL PROPERTIES OF BRONZES

Type of Furnace	Coke-Fired 75 min.	Electric 17 min.	Electric 25 min.
Melting Time			
Elastic limit, lb. per sq. in.....	15,560	16,560	16,610
Elastic limit, kg. per sq. cm.....	1,094	1,164	1,168
Ultimate strength, lb. per sq. in...	30,900	30,620	28,940
Ultimate strength, kg. per sq. cm.	2,172	2,153	2,035
Elongation in 5 cm., per cent...	17	17	18.5

These tests prove that the quality of metal in either process is equally good, and that fast melting in the electric furnace does not injure the metal.

COMPARATIVE COSTS

So far as the comparative cost of melting is concerned, as near as I can estimate there is about \$3.00 per short ton (910 kg.) of melt in favor of the electric melting

TABLE III.—COMPARATIVE COSTS PER SHORT TON (910 kg.)

Coke Fires	Electric Furnace
Coke at \$8.00 per ton.... \$5.20	Electric Power \$6.50
Crucibles 2.10	Electrodes 1.69
Wood 0.30	Linings 0.56
Charcoal 0.30	Charcoal 0.30
Repairs on Linings 0.90	Repairs on Linings 0.20
Metal Loss, 3 per cent.. 5.20	Metal Loss, 0.6 per cent. 1.80
Labor 0.50	Labor 0.32
\$14.50	\$11.37

with our equipment. This is an estimate, as we are still running coke and electric fires with the same operators, and it is difficult to keep separate records. However, we feel that this is accurate at the present prices of coke, electricity, crucibles, etc.

Mill Bronze

Q.—Please furnish us with the best mixtures for mill bronze purposes, for high motor driven machinery and slow rolling bearing purposes.

A.—We would suggest the following mixture for this purpose, one that is said to give good results.

80½	Copper
17	Tin
2	Lead
½	Manganese Copper

—W. J. REARDON.

*A paper presented at the Forty-sixth General Meeting of the American Electro-chemical Society, held in Detroit, Mich., October 2, 3 and 4, 1924.

Pyrometers in the Metal Plant

How Pyrometers Aid in the Rolling Mill and Brass Foundry

Written for The Metal Industry by C. L. SIMON, The Brown Instrument Company

There is a story of a golfer who awoke from a dream one night, crying "I have found it!" and when his wife asked him what it was he had dreamed, he replied, that he had found a device to be inserted in a golf ball, which would automatically call out "Here I am."



FIG. 1. PORTABLE PYROMETER

If some foundryman could patent a device to be inserted in a ladle which would automatically call "I am too hot to pour," or "I am too cold to pour," when it was filled with molten metal, he would be a millionaire in a year. So far, no such device has appeared, but the pyrometer for molten metal work aids very materially in determining the correct pouring temperature. True, it only indicates the temperature of the batch, and the man who is handling the metal must act on this information. It will no more make good castings, than owning a watch will make a man catch a train. He must act on the information it gives him.

Every foundryman knows that if one day is cloudy, and dull, and the next day is sunny, it is practically impossible for the worker to judge accurately the temperature of the molten metal by color. The head of one of the largest foundries in the country says "No man can handle one metal for a day or two and then change to another and get his pouring temperatures correct." A standard text book on foundry practice answers the important question "How much difference does the right pouring temperature of your metal make?" by the following:

"If the temperature is increased beyond the degree of fluidity necessary to pour, it would cause injury to the metal and make more blow holes in the castings."

The higher the temperature is raised when melting, the more oxide and gases will be formed, and if the temperature is great enough to obtain a white or boiling heat,

it may be impossible to produce sound castings; in addition, the castings will be brittle.

Further, when a high percentage of tin is used (to give extra fluidity to brass that is to be used in making thin castings), care must be taken that the metal is not poured too hot, as it may boil or kick out the mold.

So much for the harm done by pouring at incorrect temperatures. Now for the solution. The answer is—a **pyrometer**.

In the minds of many foundrymen, there seems to be a sort of mystery surrounding this really simple instrument. The principle is not complicated at all. When two wires of different metals are welded together at one end, and the joint is heated, a small current is set up, when the other ends are brought together. But, if instead of joining these wires, they are connected to an instrument which will measure the current developed, and which is graduated in degrees of temperature, instead of electrical current it will be found that the amount of electricity indicated will be proportional to the temperature of the heated wires. These wires are called a "thermocouple" (Fig. 3); the instrument for measuring the electrical current is called a "pyrometer" (Fig. 1).

The method of using it is quite simple. When a heat is poured from the furnace to a ladle, one of the workers sticks the end of the thermocouple into the molten metal, holds it there for a moment and reads the temperature (Fig. 2). Depending upon the work being done, and based on his previous experience, he will know whether the metal is too hot or too cold to pour.



FIG. 2. TAKING THE TEMPERATURE

If it is too cold, it is remelted, if too hot, a few moments are allowed to elapse, until the right temperature is reached, and it is then poured.

After a few trials, a man becomes quite expert in the use of this instrument, and from then on he can repeat his best results. The instruments may be in a permanent installation with the thermocouple permanently inserted through the top of the furnaces, such as electric furnaces.

For these installations, however, it is usual to use wall type instruments while for the ordinary foundry practice the portable equipment is most satisfactory.

Naturally enough, the molten metal will have a tendency to eat away the ends of the thermocouple which are welded together, but inasmuch as these ends are furnished in short lengths, which are replaceable, and furthermore, the wire being $\frac{1}{8}$ " or $\frac{1}{4}$ " in diameter, it takes many insertions before the end is eaten away (Fig. 3). For some metals, such as aluminum, where the tendency of the metal is to harden between the thermocouple wires,



FIG. 3. THERMOCOUPLE WITH REPLACEABLE TIP.

the end of the thermocouple is enclosed in a metal tube. Most pyrometers now on the market are of rugged and sturdy construction, and are accurate to within a few degrees.

After a man has once used a pyrometer, he hates to do without it, inasmuch as he can give up **guessing**, and substitute definite facts.

Taking the temperature of molten metal is not the only place in the foundry where heat-measuring equipment is being extensively used. Another place is on the core ovens where recording thermometers make records every 24 hours of the temperature of the inside of the oven (Fig. 4). Imagine a man with a mercurial thermometer standing beside your core oven. Every fifteen minutes he marks down the temperature registered by the thermometer. He turns in a report every day. Now imagine an instrument which has the bulb inserted through the top of the core oven and makes a **continuous** record of your core ovens, a record that is made in plain ink on plain paper, so clear that everyone can read immediately and exactly how the core oven temperature varies all during the night and day, showing how evenly your temperatures were held, how the night man did his work, etc. Too high a temperature on cores (that is, drying the cores too quickly) sometimes crack them;

sometimes it causes them to warp on one side, sometimes there are soft centers which cause blow holes in the castings. Too low a temperature means wasted fuel, and cores that crumble when you try to handle them. The recording thermometer shows if the correct temperature has been maintained. If it has not, the foundryman can take steps to correct this. If it has, he can go about seeing what has been incorrectly done in the manufacture of the cores themselves, the wrong kind of binder, handling, etc.

The recording thermometer makes a chart which gives a complete record every twenty-four hours. The recording pyrometer, however, makes records of two ovens on separate sides of the same chart, which show every fluctuation clearly. This record lasts for two months, without renewal, and is torn off from the instrument whenever convenient.

To sum up, the indicating portable pyrometer for molten metal work, and the recording thermometer, or pyrometer for core ovens, will eliminate considerable spoiled material, make the work easier and more interesting for the men, and will give them **facts** instead of **guess work** to go by. Thousands of these instruments are in use throughout the entire country, and are giving complete satisfaction. There is nothing experimental about the equipment; it has been definitely proved that it will help effect savings that will amount to considerable in the course of a year.

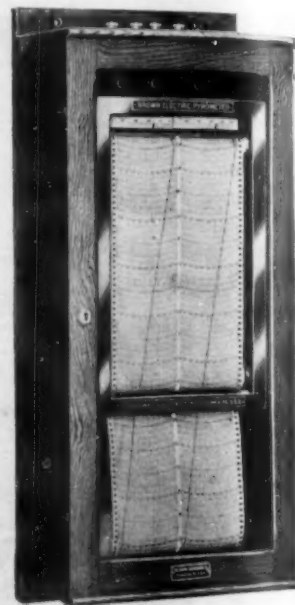


FIG. 5. CONTINUOUS RECORDING (TWO RECORD) PYROMETER FOR TILTING FURNACES OR CORE OVENS.



FIG. 4. RECORDING THERMOMETER ON CORE OVEN.

The Manufacture of Tinsel

The Production of Silver and Gold-Plated Copper Wire and Their Subsequent Treatment to Make Tinsel

Written for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

To me there seems to be a halo around tinsel because in my childhood's memory it stands out more prominently than anything I know of. It brings back memories of childhood's happy hours of the Christmases of long ago. Tinsel somehow seems to me like the memory of beautiful flowers in the garden of memory that will linger while life lasts, and will never fade.

When and how tinsel was first produced, I have no idea, but I think that the City of Lyons in France may have been its birthplace, because in the famous old city of France, silvered and gilded copper wire was first made for the production of gold and silver brocades and military braids. The gold plated copper wire is still made there. Germany, previous to the war, made quantities of gilded and silvered copper wire, but today America produces more than 90 per cent of all the silvered copper wire that is used. All the imitation gilded copper wire is produced here, but there are only two or possibly three firms that produce such a product. The greatest producer of all is the Hudson Wire Company of Ossining, N. Y. There has appeared upon the market at the Christmas season the past two years, a lead tinsel or rather a fine lead shaving, but as compared with true tinsel, it is as dross as compared with a virgin metal.

True tinsel is a combination of the wire drawers' and the electro-platers' art. It commences when the copper ore is taken from the earth, smelted, refined and cast into rods. These rods are rolled hot through steel rolls and through successive stages that reduce its diameter and increase its length. It finally reaches the stage where the wire drawer plays his part. Hard cast steel dies are used until it reaches a diameter of 20 B & S gauge or .035 decimal gauge. When this diameter has been reached, the copper wire is bright annealed in air tight iron pots and when cooled again, cleansed in cyanide solutions. After a thorough washing it is ready to start on its way to become tinsel.

Diamond dies are used. The holes of definite sizes are drilled through the diamond with steel drills and diamond dust. The hole in each successive die must be smaller than the previous one so that the diameter of the wire is constantly reduced until the minimum size wire results, usually from 2 to 3 one-thousandths of an inch thick or about 38 B & S gauge. The diamond die is set in its holder of babbit metal and brass to hold the diamond in a secure position during the wire drawing operations. The silver plating process commences when the copper wire is reduced to 20 B & S or .035 decimal gauge. The methods of plating are continuous, being similar to those described in Langbein's *Electro-Deposition of Metals*, covering the gilding and silvering of copper wire. Many improvements have been made in the mechanical features by the progressive manufacturer.

The silver solution is composed of sodium and silver cyanides, the metal content 4 to 5 ozs. per gallon; the sodium cyanide content (free cyanide) is kept low, but a concentrated solution is constantly dropping into the silver plating tank to keep up the maximum of anodic reduction and cathodic deposition. This is possible because silver, unlike many metals, does not deposit under the influence of hydrogen, so Faraday's law can be used to the maximum without figuring any loss of current den-

sity, due to the evolution and deposition of hydrogen.

The cleansing of the copper wire is accomplished by drawing the wire through a diamond die that slightly reduces the diameter of the wire. As the wire comes from the die it is clean and bright and free from oxide. Thus the wire enters the plating solution passing over a bright, hardened steel negative contact roller that is revolved to equal with the speed the wire is entering the solution. The wire is run down into the solution and then up again vertically over a series of rolls specially made. Those at the bottom of the tank are made of glass suitably sand blasted so that the wire will not slip; the upper rolls above the solution of bright, hardened steel. Under the influence of the current the upper rolls become coated with silver to some extent. I am not positive as to the total length of wire exposed to the solution, but believe it is about 100 ft. Many strands of wire are passing through the solution at one time, so that the total length being plated at one time may approximate 2,000 ft. The upper steel rolls are grooved so that the twenty strands of wire can be kept uniformly apart. It required some skill to make suitable mechanical equipment to take care of the speed of movement of the wire through the solution and then to rewind it again upon spools as it passed through the solution.

No washing operations are required as the silver plated wire emerges from the solution. It is drawn through a diamond die again that slightly reduces its diameter. The solution thus acts as a lubricator and returns again to the tank. The wire is then spooled up clean and dry.

The amount of silver deposited is one per cent of the total weight of wire. In other words, 1 lb. of metallic silver is deposited upon every 100 lbs. of wire starting at 20 B & S gauge or .035 decimal. As the surface area of the wire is always the same, the current factors as first determined upon can always be maintained so the operations are in a sense purely mechanical.

The wire thus silver plated is now drawn through diamond dies until its diameter is reduced to 3 one-thousandths of an inch. At this diameter it is ready to be made into tinsel. The adhesiveness of the silver deposit must be positive, otherwise in the reducing operations, through the diamond dies, it would be removed and give a copper wire instead of a silver wire. The ductility and malleability of silver and copper are about equal so the elongation, due to the drawing process, is about the same. The wire reduced to its final stage has a splendid burnished surface.

There is a silver and gold tinsel. The gold color is not a gold but a high brass color, that is produced upon the copper wire, not by brass plating but by vaporization. Brass plating has been tried many times without success. The brass deposit always becomes brittle in the ensuing drawing operations, so has been discarded in favor of the vaporization method.

Anyone who is familiar with Cowper Cowles sherardizing methods can readily see that copper as well as steel can be coated with zinc by vaporization of the zinc dust. When the steel or copper is placed in a hermetically sealed steel container heated to just below the melting point of zinc, the vaporized zinc penetrates into the steel or copper. Thus we start to produce imitation gold tinsel. The cop-

per wire, usually about 24 B & S gauge or decimal .022, is sherardized in the manner outlined. It is allowed to cool in the steel or iron sherardizing pots, and is then taken out and freed from the zinc dust, of which there must always be an excess in the vaporizing pot. The zinc coated copper wire is ready for the wire drawing operations which are the same as outlined for silver wire.

Zinc, however, is not as malleable and ductile as copper, therefore, the elongation of the copper is greater than the zinc. Thus through successive reducing operations, the zinc becomes drawn down into the copper, forming a high yellow brass alloy surface on the copper wire which results finally in the imitation gold tinsel. As previously stated, gold plating of copper wire is not done, to my knowledge, in the United States.

The present manufacturers of the highest grade of silver wire in this country today and the writer experimented in gold plating fine copper wire more than thirty years ago, and succeeded after much experiment in producing an exact reproduction of the gold plated wire produced in the City of Lyons, France.

This gold wire does not tarnish. It matters not how thinly the gold is applied; it is considerably harder than pure gold. After many months of experiment we finally decided that the "pure gold" deposit was a nickel gold alloy, approximately from 20 to 22 K gold, although the nickel could not be discovered when the gold plate on the French wire was analyzed. It was then easy to de-

posit gold upon the wire and obtain the same color as the French wire with a non-tarnishable surface.

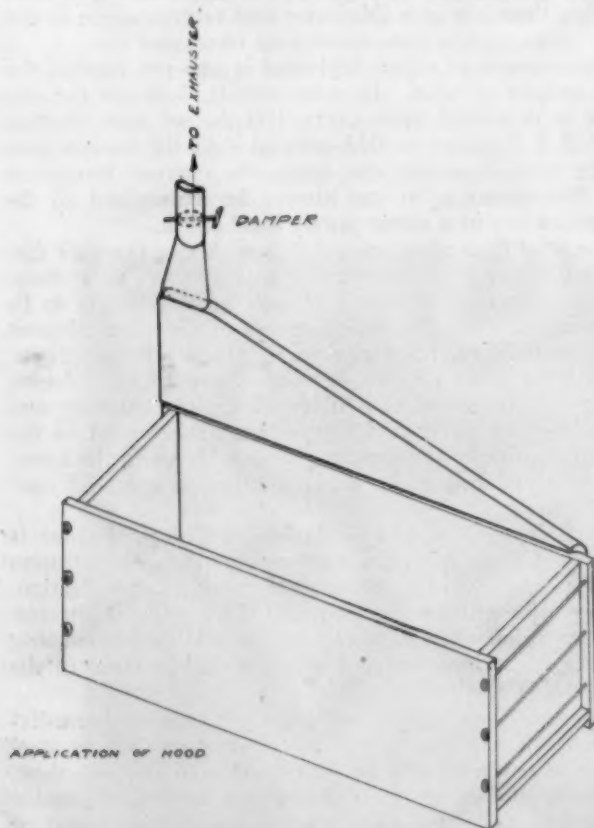
The silver or brass coated copper wire is shipped from the wire manufacturers to the tinsel manufacturers in New England. The utmost care has to be used so that the wire reaches its destination in perfect condition. The spools must, therefore, be wrapped in a non-tarnishing tissue paper, then in a waxed wrapping paper to prevent atmospheric action upon the wire or the inclusion of moisture. The shipping cases are almost air tight. Upon its arrival, after thorough inspection, it is made into tinsel. The wire is merely flattened to a definite thickness by the aid of flint hardened steel rolls, polished to the highest possible lustre. It is this high polish that leaves its imprint upon the tinsel, and gives it the splendid burnished appearance. The rolls must be constantly polished during the rolling of the wire, so arrangements are made that sheep skin buffs are constantly polishing the rolls. Two sets of buffs are used, one for the top roll and one for the bottom roll. Tin oxide is the polishing medium.

The rolls are about 12 inches long, and 3 inches in diameter. As in the plating and wire drawing operations, many strands of wire are rolled at the same time. Provisions are made mechanically so that the tinsel is spooled up just the same as sewing cotton is spooled up in the great thread mills.

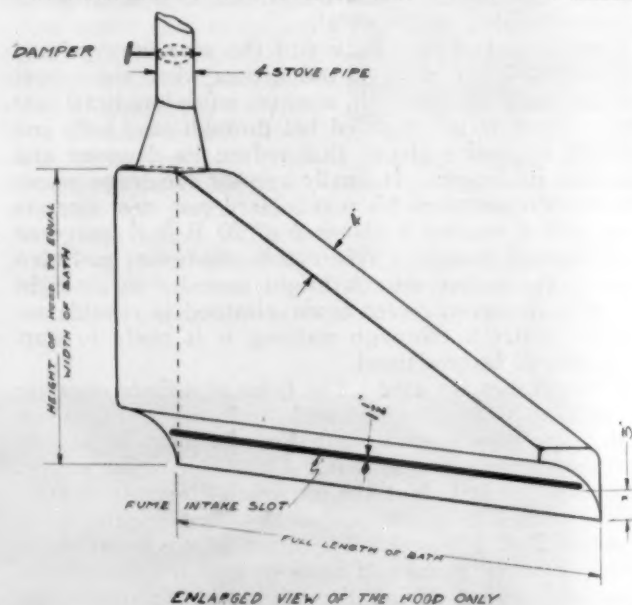
This completes the manufacture of tinsel, such as we find today.

Exhaust Hood

Plating establishments are often compelled to install hoods and exhaust apparatus for the elimination of obnoxious gases and odors. The most common style used is the funnel shaped "bakers" or "stove hood." Due to the fact that this type of hood must necessarily be at quite



IMPROVED EXHAUST HOOD



ENLARGED VIEW OF THE HOOD ONLY

a distance above the bath, so as to allow the operator to work freely, not all of the fumes are carried away, and over a large bath or tank it is practically useless.

Further, the funnel-shaped hood requires special supports or holders, and the larger the hood the larger is the pipe and exhaust fan required.

The illustration shows a very practical and efficient type of hood, which is readily adaptable to any size of bath. This hood does not require a large outlet pipe and can be operated from distance with a much smaller exhaust fan. It is not in the way of the plater in the handling of his work. It has, besides, proved very efficient as an eliminator of gases and odors generated in plating solutions.

H. E. PELLETIER.

A Desc

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Durability of Plated Surfaces

A Description of Nickel Plating as it is Carried on in a Modern Automobile Manufacturing Plant*

By W. M. PHILLIPS,

General Motors Corporation, Detroit, Mich.

Nickled radiator-shells and other steel parts of automobiles are very much the style at present. It is obvious that the nickel plating should be made very durable, this being particularly necessary in connection with the use of the better grades of automobile finish, such as those of the nitro-cellulose or lacquer type.

Thickness of plate has proved to be an essential factor if the plating is to be durable, but to secure a plating

or leather, the ground abrasive being held on the wheel by glue or by grease. Polishing is the most expensive part of the work of plating. It is done by skilled workmen who receive relatively high pay; so, if anything can be done to reduce this item of the cost, plating can be done more economically.

In plating steel parts, it has been the practice in some instances to make a very thorough job of the polishing. The resultant product then had a very pleasing effect just after it was finished. But, if too much of the available money is spent on the polishing, less can be spent on the plating and it will not have as great durability. When the cost is fixed, it often is best to spend less on the polishing and more on the actual plating.

PLATING

Let us consider the plating of steel with nickel. Recently, tests were made to determine the thickness of the nickel-plate on the parts of a popular-priced car. On some of the parts the plating was extremely thin; the average thickness being between 0.0001 and 0.0002 in. The thickness of a piece of tissue paper is about 0.0002 in. and hence the foregoing average thickness of plate was less than one-tenth the thickness of tissue paper. The other protective coatings on the car, such as the paint and the enamel, vary in thickness from 0.002 to 0.004 in.; that is, they are from 10 to 20 times as thick as the plating mentioned.

If the surface of the work be reasonably well polished, it can be plated lightly with a preliminary coat of nickel, say 0.0001 in. thick. This is recommended by Edwin M. Baker in his paper on the Rust Resistance of Nickel-Plated Steel.¹ One advantage of this procedure is that, because nickel has more "throwing" ability than has copper, it is more likely to plate into the crevices and deep portions of the work than copper.

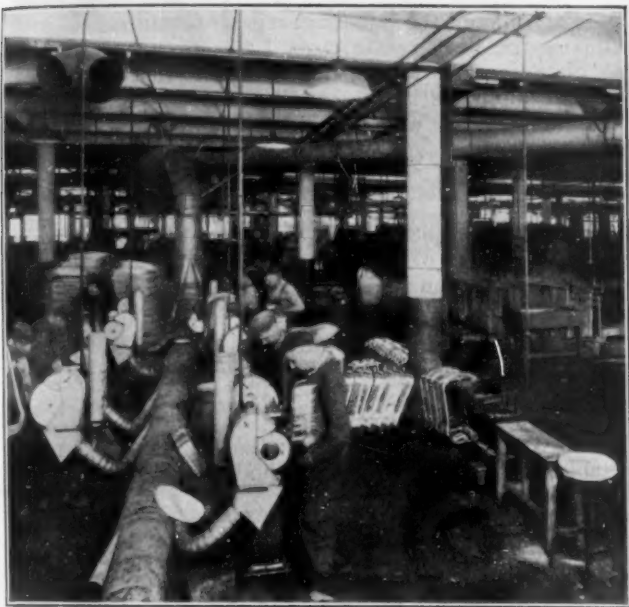


FIG. 1. THE POLISHING ROOM AT THE OLDS MOTOR WORKS

of the desired thickness that will adhere to the metal satisfactorily requires that the plate itself have suitable physical characteristics and that the surface to which it is applied be clean. Further, the metal to which plating is applied should be as free as possible from blemishes and pits, this being especially important when plating steel or iron. There should be no slag or anything else on the surface; only the metal itself.

CLEANSING THE WORK

Before being plated, the parts must be cleaned thoroughly. Grease, rust and scale must be removed completely. The importance of adequate cleansing cannot be overemphasized. One method is to use, in all the preceding operations, greases that can be removed easily. Another is to provide suitable equipment and the proper type of cleaning compound for the work to be done.

It is customary to dip the parts into a "pickling" solution, which is composed of hydrochloric acid and water. This removes all rust and traces of alkali that may exist on the surface to be plated. The solution can be used either with or without the aid of electric current.

POLISHING

All the abrasive-wheel operations before the actual plating is done are included under the term "polishing." Most of this work is done on wheels made of muslin, felt

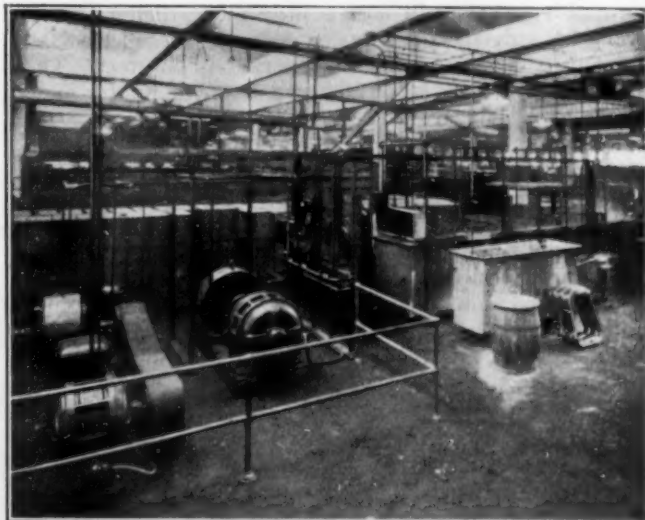


FIG. 2. THE PLATING ROOM AND CONVEYOR PLATING TANKS

Whether a preliminary plating with nickel is made or not, the part being plated should receive a good heavy

* From the Journal of the Society of Automotive Engineers, November, 1924.

¹ See THE JOURNAL OF THE SOCIETY OF AUTOMOTIVE ENGINEERS, February, 1924, p. 127.

deposit of copper, plated-on in a manner that will assure good physical characteristics. If the preliminary nickel-plating has been applied, an acid-copper bath can be used for this purpose; if no first plating with nickel has been made, a cyanide-copper bath must be used.

The copped plate should be 0.0003 in. thick, or more, the idea being that, because copper is softer than steel, it is easier and therefore cheaper to produce a good surface in this manner that it is to polish the steel to a fine surface during the preliminary operations.



FIG. 3. CONVEYOR TANKS FOR NICKEL PLATING

By depositing a good heavy copper-plate, it often is possible to eliminate one or more of the polishing operations. The subsequent buffing should be done very thoroughly. This will cost a little more than to polish a very light deposit of copper; however, it will cost less than any one of the polishing operations on steel. This buffing tends to cover scratches and pores in the metal surface, and will leave it comparatively smooth. The work should then be cleaned thoroughly and the final nickeling operation concluded. The thickness of the final nickel-plate should be at least 0.0002 in.

Fig. 1 shows the polishing-room at the Olds Motor Works, and the relation between the locations of the plating-tanks and the polishing-machines. All the polishing-lathes are motor-driven; and the room is well lighted because it is essential that the men who do the polishing see their work clearly and thus be enabled to do the polishing effectively.

Fig. 2 illustrates the cathode plating-tanks used for copper-plating; they are equipped with conveyors, inside. The parts to be plated are suspended within the tank at the near end, conveyed along through the plating solution and then removed from the far end, thus lessening the amount of walking needed to load and unload the tanks.

Fig. 3 is a view of the cathode conveyor-tanks used for the nickel-plating of all the car parts so treated. A great advantage of the conveyor-tank is its passage of the parts through all the plating solution and consequent production of plating that is uniform.

The generator shown furnishes electric current at the

proper voltage for plating, and the filtering apparatus affords a means of keeping the plating solution clean.

COST

Considering a steel radiator-shell, for example, the cost of each polishing operation may average 9 cents. If seven polishing-wheels are used, the polishing will cost 63 cents. The plate will be about 0.0002 in. thick and will cost about 6 cents. The most of these costs is for labor. Two buffing operations at about 9 cents each will cost 18 cents; making the total cost about 87 cents.

If the heavy-plate method is used, two polishing operations can be eliminated; and, if five polishing wheels are used at 9 cents for each, the cost will be 45 cents. A heavy plate requires that the work remain in the plating-tank longer and means that more metal will be deposited, but the amount of labor required remains the same. Suppose the heavy plate costs 12 cents more than does the plate for the former method, and that the buffing costs 2 cents more; the finished-product cost will be about 2 cents less than with the usual method, but the plate will be three times as thick.

TESTING

Thickness of plate can be determined by chemical analysis. A piece of paper or other suitable material, 1 in. square, is placed on the finished surface and brushed over with paraffin; the paper square is then cut out with a sharp knife and removed, the plating under it is dissolved with nitric acid and the amount of plate metal determined by usual methods.

Salt-spray should be made also, in accordance with the method recommended by the Bureau of Standards; or a suitable modification of this method should be made and used.

The salt-spray testing-apparatus used at the plant of the Jaxon Steel Products Co. is located in the chemical laboratory, there, in which the raw material is analyzed, the plating solutions are prepared and the finished product is tested. Uniform results from plating cannot be expected unless the determinations are made in a laboratory, for, it must be remembered, the work of plating is done to limits of the order of 0.0001 in. One would not expect a tool-maker to work to such fine limits unless he were equipped with suitable micrometers and gages; and the need for chemical tests in plating work is fully as great.

Zinc-plated rims and rim parts are tested for at least 48 hr. in the salt-spray apparatus shown in Fig 5. But this specification is several times as severe as is deemed safe for nickel-plated articles at present. This type of equipment is needed when it is necessary to test large quantities of parts.

SUMMARY

In conclusion, let me state again the main ideas I have tried to convey. They are summarized by saying that

- (1) Polishing costs constitute the largest item in nickel-plating; they are too high
- (2) Plating is the most important part of the process. The average thickness of nickel-plate is but one-tenth the thickness of tissue paper; by making the plate thicker the polishing cost can be made enough less to compensate for the additional cost of the thicker plate
- (3) Thick plate that has good physical characteristics probably will be durable
- (4) The chemist and the plater should co-operate.
- (5) Nickel-plate should not be considered satisfactory because it looks all right; it should be tested to make certain that it is right

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1 Part I w

Electro-Plating Costs

A Description of a Practical and Workable Method of Arriving at the Cost of Plating Operations.
Conclusion.¹

Written for The Metal Industry by JOSEPH HAAS, Jr.

POLISHING ROOM COSTS

The gathering of data for polishing and buffing costs, in its general principles, differs in no way from those outlined above for plating costs. In very many ways it is less complicated. Polishing and buffing have been for years piece work operations, so at least on the question of direct labor very little work is required. In the consideration of overhead, the various items receive the same treatment, as outlined under plating.

GATHERING OVERHEAD DATA

The gathering of this data is not within the scope of the plater, but he should be called upon to give his co-operation. The cost department can no more be expected to intelligently distribute the various expenses without proper assistance, than the plater could deposit metals without solutions. Yet the cost department is frequently called upon to work at a disadvantage not wishing to create friction, and consequently many expenses find their way into the miscellaneous column. In this way one of the chief reasons for the existence of cost finding methods, namely, "analysis of expenses," is lost.

1—Direct and Indirect Labor; Maintenance of Department Equipment.

In order that the overhead distributing factor may be determined, it is necessary that a record be kept of all money expended for direct and indirect labor in the department. Furthermore, it is advisable when starting to tabulate indirect labor to divide it into classes, as shown in the table below. Since the various repairs that are generally performed for the plating department by other

departments are necessary to keep the production of the plating department moving, such wages paid are chargeable to the department as indirect labor. But wages paid for the performance of such labor, should be kept in a separate account from the indirect wages of the plating room help for analytical purposes.

FORM 1

WAGES AND INDIRECT LABOR EXPENSES MONTH OF SEPTEMBER

Week Ending	Direct Wages	Indirect Wages		Maintenance of Department Equipment	
		Employee	Wages	Employee	Wages
9/6	148.36	Plating Dept.	16.90	Electrical Dept.	4.15
		Foreman	50.00	Labor Gang	5.30
		Clerk	16.00	Tool Room	2.36
				Blacksmith	3.30
9/13	181.39	Plating Dept.	12.50	Electrical Dept.	13.41
		Foreman	50.00	Tool Room	152
		Clerk	16.00	Blacksmith	3.00
9/20	206.69	Plating Dept.	12.34	Electrical Dept.	4.27
		Foreman	50.00	Carpenter Shop	5.65
		Clerk	16.00	Tool Room	4.88
9/27	216.59	Plating Dept.	17.55	Electrical Dept.	3.41
		Foreman	50.00	Labor Gang	1.25
		Clerk	16.00	Machine Shop	8.25
				Blacksmith	1.60
				O. Dawson	19.25
Totals 753.03			323.29		86.60

2—Anodes and Chemicals.

Metal or anode costs to be distributed, with the exception of gold and silver, which are very readily directly

ANODE RECORD FOR COSTS

NICKEL						COPPER					
Date	Inventory	New	Total	Cost per pound	Total Cost	Date	Inventory	New	Total	Cost per pound	Total Cost
1/1/23	850*			.50	425.00	1/1/23	1600*			.16	256.00
3/15/23		1500		.60	900.00	5/10/23	1200			.14	168.00
			2350		1325.00				2800		424.00
1/1/24	150			.50	75.00	1/1/24	400			.16	64.00
	1325			.60	795.00		1000			.14	140.00
									1400		204.00
			1475		870.00						
Value consumed			1923:—		455.00	37.92	Value consumed		1923:—		220.00
											18.33

METAL AND CHEMICALS MONTH OF SEPTEMBER

Date	Nickel Anodes	Copper Anodes	Sodium Cyanide	Soda Ash	Borax	Boric Acid	Caustic Soda	Single Nickel Saltz	Sodium Chloride	Sulfuric Acid	Muriatic Acid	Sodium Silicate	Water
9/3/24			100*	100*	100*		100*	50*		200*		25	
9/11						50				200			
9/12											10*		
9/15			100							200			
9/20				100			50			200			
9/29								25*	25*				
Totals			200*	200*	100*	50*	150*	50*	25*	800*	10*	25*	137,500 gal.
			@ .22	@ .02¼	@ .09	@ .10¼	@ .04¼	@ .12	@ .03	@ .01¼	@ .01¼	@ .01¼	@ .75 1000 gal. per
	37.92	16.67	\$44.00	4.50	9.00	5.25	6.38	6.00	0.75	10.00	0.13	.34	130.13

Total Expenditure Metal and Chemicals—\$271.07

*Denotes pounds.

¹ Part 1 was published in our issue for January, 1925.

chargeable, present a rather difficult problem, especially when the plating department deposits several kinds of metals. One class of goods may be brass plated, and another may be nickel plated. However, when it is considered that the cost of the common metals is very cheap, the method outlined below cannot be severely criticized.

Assuming a plating department in which no record of metal cost had been kept, at the beginning of the year, an inventory is taken of the anodes. If the purchase value of the anodes cannot be furnished by the purchasing department, the market value of the metal is taken. The value of anodes purchased are added in. At the end of the year, an inventory is again taken, to find the loss in weight and loss in value. The lost value determined is then divided by twelve (12) for the monthly metal distribution. The sum of all the metals is then regularly added to the chemical record every month.

In gathering chemical costs when there are only one or two kinds of metals deposited, and when the nature of the product is not greatly varied, and handled in the same production units, it is entirely practical, by keeping a record of gross production and value of the chemicals consumed, to work out a "blanket chemical cost" per unit that is very accurate. In this way cost of chemicals becomes a direct cost and is kept out of overhead. But in the largest number of cases, it will be found necessary to include chemicals in overhead. The chemicals are held to the general stores account until requisitioned, and are then credited to the stores account and charged to the plating department. This should be done so that no month is overcharged with too large a quantity of any chemical, which, as received in barrel lots, might last over a period

is being used for power, heating, and process work. Some plants even have flow meters to indicate the amount of steam consumed by various departments or particular processes.

Again the situation may be such that power and light are bought outside, and steam for heating the building and for process work may be generated in the plant. The determination of the power and light expense for a month, in such a case, is obtained from the bill received. The monthly charge is pro-rated to the various departments by multiplying the amount of the bill by percentage rates determined from time to time by meter readings on the mains leading to each department. The plating room having had its percentage rate determined, both power and light are readily chargeable.

Thus far the overhead items gathered have been what is generally termed operating overhead or expense, since they will increase or decrease with production. The rest of the overhead expenses are called fixed expenses. The fixed expenses are those items which practically remain constant in amount, and continue unaffected by the volume of the production. Unless additional new equipment is added, or old equipment is scrapped, they remain at the same figure from month to month for a particular year. They are the chief cause of creating fluctuations in overhead rates as the production varies. These items are:

1. Rent on floor space of department; interest on investment in plating department.
2. Depreciation of plant; depreciation of department equipment, as tanks, generators, meters, steam, and water lines.

These two items are pure cost accounting problems for

MONTHLY OVERHEAD ANALYSIS DEPARTMENT PLATING

Month	Direct Wages	Indirect Wages	Maintenance	Chemicals	Power	Light	Steam	Rent	Interest on Investment	Depreciation	Total Overhead	Overhead Factor
Jan.												
Feb.												
Mar.												
Apr.												
May												
June												
July												
Aug.												
Sept.	753.03	323.29	86.60	271.07	184.70	7.15	90.00	225.00	50.00	35.00	1,272.81	169%
Oct.												
Nov.												
Dec.												

of three or four months. At various periods during the month, according to predetermined consumption, chemicals might be requisitioned in multiples of twenty-five (25) pounds and kept in the plating room for convenience. A department record at the end of a month would have the following appearance:

3—Power—Steam—Light.

These items of overhead are either obtained from outside sources, or generated in one's own plant. Especially power and steam present difficulties in their proper distribution. Most frequently an arbitrary division based upon the opinion of the engineer or superintendent are used, but such a method is a wild guess, and it not to be recommended. The difficulty in distributing power charges, is that often the same boiler supplies steam for power, building heating, and process work, and it is difficult to say how much for each. In an ideal factory where accountancy has reached a high degree of accuracy, meters will be found, which will show how much steam

which definite general rules have been established and would be in the jurisdiction of the accountancy department. On record in the accountant's office is a list of the various department equipment with valuation and depreciation, rent, etc., to be absorbed by overhead. The detailed information having been gathered, the factory cost office is ready to figure the overhead, and calculate plating costs on the various items manufactured. The complete cost of processing a unit quantity of any article through the plating department will be:

$$\text{Direct Labor Cost} + \text{Direct Labor Cost} \times \% \text{ Overhead} = \text{Total Plating Cost.}$$

In writing this article on electro-plating costs, it is thoroughly realized that there is much to be criticized, but the stand is taken that it is better than many methods of common practice. A start in methods of cost finding, even though not the best method, leads to later improvements and refinements.

NOTE:—Figures used in article are illustrative and not actual.

Nickel Plating Die Castings

Special Report No. 17, Research Committee, American Electro-Platers' Society*

By B. E. MILLER and R. L. SHEPARD

The following outline and notes as given on the plating of die castings are based on our experience in handling 30,000 to 50,000 pieces per day during the past two years. Actual figures of the past six months show that our rejects run less than .5 per cent, which is quite satisfactory from a production standpoint. Yet we are constantly experimenting to improve details of our practice, and do not yet feel that we have reached a point where we can outline a practice as standardized.

Success in the plating room starts with the raw materials used in the manufacture of the alloy, is very much affected by melting room and die-casting practice, absolutely dependent on the finishing operation, and determined finally by the procedure and skill of the plater. So much can be said on the effect of the alloy, casting and finishing, that detailed discussion on these phases is reserved for a future paper on "The Manufacture of Die Castings for Plating." The scope of the present paper is therefore confined to the actual plating.

Castings received from the polishing room with adhering buffing compound must be soaked or scrubbed in gasoline or a mixture of equal parts gasoline and carbon tetrachloride. It is much better practice, however, to insist that they shall be left clean from the wheel, in which case the gasoline cleaning can be eliminated. We are at present using successively two hot electric cleaners. The first is a caustic cleaner strong in soap which does the heavy cleaning; the second is a weak alkaline cleaner for removing the film of soap left from the first cleaner.

Caustic Soda	2 oz. per gal.
Tri Sodium Phosphate	2 oz. per gal.
Soda Ash	1 oz. per gal.
Whale Bil Soap	1½ oz. per gal.

In use the caustic soda is converted to soda ash and the soda is precipitated as scum. To strengthen this solution, therefore, it is only necessary to add caustic soda at the rate of two pounds per 100 gallons every few days, and about two pounds of soap about once a week.

The second cleaner has the following composition:

Tri Sodium Phosphate	2 oz. per gal.
Soda Ash	1 oz. per gal.

In use it becomes contaminated with soap which may cause peeled plate. At the first sign of trouble due to this cause it should be thrown out and a new solution made up.

In addition to the cleaners, we use a muriatic dip (½ pint per gallon) and a cyanide dip (2 oz. per gallon).

The plating tank is 30 inches wide, 24 inches deep and 10 feet long, with agitated cathode rods with a 6-inch stroke, moving ten to twenty times per minute.

The solution need not be of any particular formula. The factors governing its composition are the nickel content of 2.10 oz. per gallon, conductivity of 15 amperes per square foot of cathode at 3 volts, and acidity of 5.7 to 5.8 by the Bureau of Standard's drop ratio method. The following solution answers to above requirements, and has given very satisfactory service:

Water	1 gal.	Common Salt	4 oz.
Double Nickel Salt ..	10 oz.	Sodium Citrate	½ oz.
Single Nickel Salt	3 oz.	Total Solids	20½ oz.
Epsom Salt	3 oz.	Baume at 70° F.	11.8°

*Read by E. W. Woodmansee before the Detroit Branch. Published in The Monthly Review, October, 1924.

Another solution which is equal or better in every respect, and in addition is much simpler to control from the laboratory, or by the plater, is made up as follows:

Single Salt	10 oz. per gal.
Sal Ammoniac	2 oz. per gal.
Baume at 70° F.	7.0

It is particularly recommended that the solution be analyzed at regular intervals of one to two weeks, to determine its exact composition. Varying conditions of concentration by evaporation, and dilution by dips and fillings up the tank may so affect the composition as to make it quite uncertain.

It is even more important to control the acidity exactly by routine tests. It is our practice to test all solutions daily, late in the afternoon, and make proper additions after the tanks are shut down. If a solution is too alkaline, one pint of hydrofluoric acid is added; if too acid, one pint by routine tests. It is our practice to test all solutions of ammonia is added. The proper range is pH=5.7 to 5.8. Above this the plate will tend to be duller, the solution muddy, the anodes passive and the plate pitted. Below this point the plate will tend to be brittle and peel and the cathode efficiency low.

Proper racking and wiring of the work is important. If wired the pieces should be ½ inch to 1 inch apart, so as not to shade. If racked they should be arranged similarly to avoid overlapping, and also to avoid high points, which take a strong direct current. All contacts must be tight to avoid streaking.

In carrying on regular production the work should be handled by a crew of two, three, or four men, one of whom is an experienced operator who directs the others and regulates the current. The current required will be from 2¼ to 3½ volts, which will be determined by experience for different classes of work. The time required will be 10 to 20 minutes, similarly determined.

During the course of production it frequently happens that castings fall from the racks to the bottom of the tank. The tanks should be carefully fished every night to remove these castings. However it frequently happens that some castings are not removed, and in the course of several months the solution becomes contaminated with zinc, giving a streaked nickel. If time and solution storage space are available the zinc may be precipitated with sodium bicarbonate, allowed to settle and the clear solution decanted off.

The sequence of operations is as follows:

- | | |
|-----------------------------------|------------------------------------|
| (1) Soap cleaner, 5 to 10 seconds | (7) Cyanide dip |
| (2) Cold water rinse | (8) Cold rinse |
| (3) Alkaline cleaner, 5 seconds | (9) Nickel plate, 10 to 20 minutes |
| (4) Cold rinse | |
| (5) Muriatic dip | (10) Cold rinse |
| (6) Cold rinse | (11) Hot rinse |

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Review of the Silver Market for 1924

The Market During the Past Year and Prospects for 1925*

HIGHER PRICES

The improvement in general conditions and sentiment has been reflected by the silver market. The high price for the year in New York of 72½c. exceeded the 1923 rate by 3½c., and established a new high since the quotation of 72¼c. on June 13th, 1922. In the London market also the high price of the year compared favorably with the record quotations of 1922 and 1923, and in both New York and London the low quotations for 1924 were higher than those of the two preceding years.

ECONOMIC FORCES SOLE FACTOR

A most important feature relative to the price level is the fact that during the year 1924, for the first time since the war, the price of silver has been determined solely by economic forces, and without such artificial expedients as the "pegging" of the sterling exchange rate or purchases at an arbitrary price as under the Pittman Act. Furthermore, it appears that silver will be allowed to seek its natural level, at least for the present, since the silver producers at their convention held in Salt Lake City last August, temporarily abandoned the idea of forming a Silver Export Association which would have had as one of its objects the enhancing of the price of the white metal for export.

PRODUCTION

Higher prices prevailed in 1924 than in 1923 although the current year's world production almost equalled that of 1923 which was a record for all time.

From information now available it appears that production in 1924 will fall short of that in 1923 by about six million ounces only, which difference is chiefly due to the decreased output of United States mines. We estimate this country's production as sixty-five million ounces, that of Canada as nineteen million ounces, and Mexico's as ninety-two million ounces. The remainder of the world's output from all other countries we consider unchanged at approximately sixty million ounces.

SUPPLIES FROM MELTING AND FROM DEBASEMENT OF COINAGE

On the other hand, there has been a considerable falling off during the current year in the supplies of silver acquired by the melting of old coinage and the debasement of new issues. We estimate the quantity from these sources in 1924 as twenty million ounces, compared with more than twice this amount in 1922 and 1923. The chief decrease is in the amount made available by the debasement of British coinage, which we estimate this year at only two million ounces, although supplies from melted Continental coin are also smaller. This latter figure we set at eighteen million ounces, of which amount Russia and Portugal have contributed more than half.

DEMAND FROM CHINA

According to figures published by the U. S. Department of Commerce, exports from China to the United States for the first nine months of 1924 compared with the same period in 1923 dropped from \$140,750,000 to \$85,250,000. Stagnation in trade is further shown by the fact that stocks of silver in Shanghai have increased from about 45 million ounces at the beginning of the year

to about 87 million ounces at the close, notwithstanding the relatively small imports of bullion.

INDIAN DEMAND

The export trade of India on the other hand has flourished, owing to favorable agricultural conditions, and the bazaars and banks have been importers of huge amounts of bullion in settlement of foreign balances. Towards the latter part of the year the demand has been for gold rather than for silver, because the position of exchange favored the yellow metal; but in spite of this fact shipments of silver to India for 1924 surpassed last year's figures of 100 million ounces.

DEMAND FROM THE ARTS AND MANUFACTURES

Despite the fact that 1924 was a disappointing year in many lines of business, the silver industry in this country showed a decrease of only about 4% in volume from the 1923 peak, the consumption of new silver having been approximately 28 million ounces. This figure compares favorably with the total of 29,200,000 ounces used in 1923, and was the second largest amount ever consumed in one year by the arts and manufactures in the United States. Manufacturers of sterling and plated wares in general reported a very satisfactory volume of business, and the use of silver for photographic and chemical purposes increased about 10% over 1923. We are advised that the arts in England consumed 4½ million ounces this year compared with 4 million in 1923.

COINAGE DEMAND

We now come to the dominant influence among the various factors creating world demand for silver during the past year—coinage requirements. Had not various countries of Europe sought to strengthen their depreciated paper currencies by the issuing of subsidiary silver coins, silver prices during 1924 might have told another story.

We estimate the Continental coinage absorbed fifty million ounces of silver during the year.

OUTLOOK FOR 1925

While the recent keen appetite on the part of India for gold may have been somewhat disturbing to sellers of silver, we are informed by a high authority in Bombay that the 1925 demand from India for silver should equal that of 1924, provided no change of importance takes place in general conditions.

With respect to the Continent we feel that there is still a large unfilled demand for silver for coinage, and that buying from that quarter should continue, although actual requirements are problematical.

On the other hand we do not look for much support from China. Conditions in that country are still too unstable to permit of an early improvement which would result in a renewal of large buying orders. At a more distant date China may again become a prominent factor in the purchase of silver, but we shall have to look beyond the year 1925 for that happy occurrence. In this connection we quote the authority previously mentioned:

Political and economic recovery during the year has been marked, and if progress along these lines continues, we believe that 1925 will usher in a period of larger business and greater prosperity throughout the world. In this event silver should benefit by the improved conditions.

* Abstracted from the booklet issued by Handy & Harman, New York.

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THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

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EDITORIAL

MANUFACTURERS' PROBLEMS

Some of the pitfalls which beset the path of manufacturers in general, and of brass manufacturers in particular, were ably set forth by Carl Legner, vice-president of Haines, Jones & Cadbury Company, in an address recently delivered before the members of the National Association of Brass Manufacturers in New York.

Probably the greatest of all these problems is that of cost finding. At one time this work was comparatively simple, but during the last ten years, with the advent of the complicated tax legislation, and wide fluctuations in the cost of labor and materials, the once simple business of adding up the various costs of manufacture has assumed enormous proportions. Add to this the outstanding fact that companies manufacturing the same products, and by approximately the same methods, are quoting widely different prices, and one has a situation which seems to be an impossible muddle.

Mr. Legner stated the basic fact that the industry as a whole does not receive proper and adequate compensation for its products, particularly competitive staples. A buyers' market has been in existence ever since the latter part of 1920, when a reduction in prices occurred, so sharp that it brought about extreme hardship to a large number of manufacturers and merchants. Since then there has been the extraordinary phenomenon of an unprecedented demand for goods in the building line accompanied by a campaign of price-cutting which extended over manufacturers as well as jobbers. There was plenty of business but only at extremely low prices. The result has been that the jobber today is placed in the position of buying largely at a price, with quality as a secondary consideration, thus forcing the manufacturer of higher grade products to sell at prices in competition with the cheaper materials. There is, of course, a legitimate market for both high and low priced goods, but they should not be forced to compete with each other. Competition, while one of the important elements in keeping business really alive and forward-looking in order to make improvements in machinery and manufacturing methods, reached a point where it overbalanced all other considerations and resulted not in improvements, but an actual decline of quality.

No manufacturer can do business successfully or for any length of time unless he knows what his products cost him. In order to know this, he must have accurate and proper cost records, but this is not all. All manufacturing cost figures are at best only an approximation, either closer to or further from the exact truth, depending upon the detail with which they are taken. Practical considerations prevent obtaining absolutely accurate costs because of the expense involved. What is desired then, is a working method of getting within a reasonable distance of the facts. It is commonly known that different cost systems will often give different results, and it is partly due to this as well as to faulty cost systems that variations in quotations on similar items have been so wide.

Mr. Legner made a strong plea for a uniform method of arriving at costs for the brass manufacturing industry. The particular method chosen was of minor importance providing it was accurate and practical. In addition, of

course, it would have to comply with the law and restrict itself to cost finding methods, being very careful not to turn into price-fixing and open price arrangements. Mr. Legner stated that he had not yet found an expression of opinion to the effect that the adoption of uniform cost finding principles was illegal. In fact, certain Government departments are encouraging that very thing for the betterment of the industries, and for the purpose of eliminating unfair competition, which, in a great many cases, is brought about solely by the manufacturer's ignorance of his own costs.

A trade association is obviously the proper organization through which such work should be done. It is the simplest and least expensive way of handling a very costly project. There is a way out of the woods, and this way lies along the lines of co-operation and good faith, sound business standards and honest dealing. There is no more suitable medium through which to work than a trade association.

COPPER AND BUILDINGS

The importance of the building industry as a consumer of copper in the United States is so great that every bit of information about it is of interest to manufacturers of metals. Recently two estimates for the coming year have been published; one by the Architectural Forum, and the other by the Copper and Brass Research Association.

The Architectural Forum estimates that 1925 will see a total of \$5,000,000,000 spent in building. Just how much copper will be used in this connection is, of course, a difficult matter to judge, but from previous data, it can be stated that it should amount to about 170,000,000 pounds. It is stated also that there should be more general activity throughout the country, and less concentration of record-breaking activity in the New York District. Also that there will be the usual peaks of building activity; one in the spring season and the other in the late fall.

This survey points out that in 1924, the volume of building totaled \$5,500,000,000, thus indicating a decline for the coming year.

The Copper and Brass Research Association estimates a total of only \$4,000,000,000 in 1925. This is compared to \$5,341,400,000 in 1924 and almost \$6,000,000,000 in 1923. It is stated that the housing shortage has been practically overcome and that within the next few years the total shortage will be wiped out, leaving only the normal growth for the building industry to take care of. Survey indicates that in the South, the building industry is increasing. In the rest of the country with pressure relieved, more attention will be given to a better distribution of the time of building, and the usual seasonal peak for the various trades will disappear. Winter construction will become usual with consequent benefits to all parties. Labor will have steady employment, and manufacturers steady market. Moreover, the conditions will discourage the purely speculative type of construction, and for the investing owner, cheaper and better buildings will result.

Between these two estimates, one can do nothing more than to take one's choice. When dealing with figures so great it is impossible to promise or demand accuracy in

dollars. It is enough that a reasonably small percentage of error is maintained.

To the copper and brass industries, however, the real point at issue is the consumption of metals, and in a very general way it can be stated that at the present time one pound of copper is used for every \$29.00 spent in building. This is small compared to the estimated potential use of copper in building, which is one pound for every \$8.25. However, taking into consideration both sides, we have the consumption of copper in the building industries for three years as follows:

YEAR	TOTAL BUILDING	COPPER USED
1923	\$5,900,000,000	202,000,000 lbs.
1924	5,340,000,000	185,000,000 "
1925 (estimates) {	5,000,000,000	172,500,000 "
	4,000,000,000	138,000,000 "

It behooves all forward-looking manufacturers of building equipment to watch carefully the progress of the next year or two. It seems that the day of expansion in building is over. From now on it will get closer and closer to a program of replacement and taking care of normal growth.

CORROSION

In recent years, the subject of metals has assumed an importance and dignity, both to the engineering public and to the public in general, which it has never had before; and it is largely centered around one point—corrosion. The earliest metals used were copper and gold in which the problem of corrosion is almost non-existent, but with the advent of iron also came rust, which is synonymous with waste and decay. Evans, in his recent book *Corrosion of Metals*, points out that "The study of metallurgy—the making of metals—appeals directly to a limited number of persons, namely, those connected with the manufacture of metallic materials, but the study of corrosion—the unmaking of metals—has an interest for all who use metals, a far larger class."

The National Research Council through its committee on corrosion is stimulating researches through its members, the national technical societies, of which the Institute of Metals Division is one. Investigations into both theory and practice are being carried on simultaneously, with the result that the problem of corrosion is being attacked as never before. It is interesting in this connection to know that the Annual Lecture to be delivered before the Institute of Metals Division meeting in February 1925 by Dr. Benedicks is on the subject of Corrosion Studies.

Iron and steel are, of course, the most generally used metals because of their low cost. Although they are much more easily corrodible than the non-ferrous metals, it is, in many cases, more practical to use them and to replace them. However, so far as corrosion is concerned, it is an old story that they are the shortest lived metals in existence.

This, of course, does not take into account the fact that stainless steel, which is a steel with a high chromium content, has made rapid strides and is becoming one of the most important corrosion resisting alloys.

Copper is perhaps the most important constituent of alloys which resists corrosion. Although in the pure state it is not highly resistant as compared with other

metals, as the base of alloys for this purpose, it is practically indispensable.

The bronzes and brasses are, of course, proverbial for their lasting qualities, proof being the old armor and implements of war found in good condition, sometimes thousands of years after they were made. The newer alloys, such as aluminum bronze, Monel metal, etc., have not been in existence long enough to bear comparison with the bronzes and brasses of the ancients, but modern investigation and practice have shown that high copper alloys containing tin, zinc, lead, aluminum or nickel, or various combinations of these, are, in a general way, to be the most useful corrosion resisting alloys.

Aluminum has a high resistance to corrosion by most acids. On the other hand, it is very sharply attacked by the alkalis and by hydrochloric acid.

Lead, one of the cheapest metals, is also one of the most useful in resisting acids. It is used for sulphuric acid equipment more than any other metal; also for water and saline solutions.

Nickel is one of the most effective resistors both to atmospheric and chemical corrosion; so much so in fact, that it has been called a semi-noble metal. It is now available in many forms, both cast and fabricated, and its near relative, Monel, the natural nickel-copper-iron alloy is also widely used.

Tin is perhaps the most resistant metal to water and atmospheric corrosion. It is almost alone in its use in the food industries for containers. In the presence of oxygen it is attacked by the acids in canned foods and it is the canners problem to exclude air when sealing food containers.

Zinc is a good protector for iron against the weather, due to the fact that it is electro-positive to iron. Most of the zinc produced goes into zincing or galvanizing. Of course, large quantities go into the alloying.

It is important to note that, in a general way, resistance to corrosion is caused by the formation of a skin on the metal by the corroding medium. If this skin is closely adherent, it may act as protector against further corrosion. If it is loose, like rust and iron scale, it will permit corrosion to go on unchecked. It is the property of the corrosion resisting alloys, such as those containing copper, nickel, aluminum, etc., that these coatings are tight, and therefore, highly protective.

A common problem in engineering, however, is one in which it is necessary to provide a material which will resist a corroding medium while subjected to abrasion or friction. So far the perfect metal or alloy has not yet been found. Lead and its alloys are used under certain conditions but they are hardly "everlasting."

So far as the word "everlasting" can be applied to anything material, it can be said that the metals much more nearly approach the condition than iron and steel except, perhaps, for stainless steel. The future is a race between non-corrosive properties on one hand and cost of production on the other.

GOVERNMENT PUBLICATIONS

Secondary Metals in 1923. By J. P. Dunlop, U. S. Geological Survey, Washington, D. C.

Copper in 1923. (General Report.) By Helena M. Meyer, U. S. Geological Survey, Washington, D. C.

Silica in 1923. By Frank J. Katz, U. S. Geological Survey, Washington, D. C.

Rare Metals. By Frank L. Hess, U. S. Geological Survey, Washington, D. C.

Antimony in 1923. By Frank C. Schrader, U. S. Geological Survey, Washington, D. C.

New Books

The Fatigue of Metals. By H. J. Gough. Published by Scott, Greenwood & Son. Size 6 x 10—304 pages. Price, payable in advance, \$10.00. For sale by THE METAL INDUSTRY.

This work is concerned with a subject which has been commanding steadily increasing attention during the last few years. It is essentially the result of collecting and sorting out the scattered literature on fatigue of metals, and presenting it in an orderly fashion. While it is of importance primarily to the designers of structures and machines, it should be of great equal importance to the metallurgist and the fabricator since they must know what their materials can be recommended for, and will stand.

The resistances of materials to static and repeated stresses are covered intensively. A comprehensive bibliography is given and considerable mechanical test data for a wide range of metals, with particulars of chemical analysis, heat treatment, etc.

Among the particular subjects covered are the following: Repeated Stress Testing Machines; Elasticity and Its Relation to the Fatigue of Metals; Correlation of the Fatigue Range of Metal and the Results of other Mechanical Tests; The Fracture of Metals Under Statical and Repeated Stresses; Various Theories of Fatigue Failure and Associated Phenomena.

The Planning, Erection and Operation of Modern Open Hearth Steel Works. By Hubert Hermanns. Published by D. Van Nostrand Company. Size 7 1/4 x 10, 307 pages. Price, payable in advance, \$10.00.

Here is a book which, at the first glance, would seem to be outside the province of metals, since it deals entirely with the production of steel by the open hearth process. Upon further examination, however, it is clear that books of this character should be in the library of every metallurgist and engineer whether he is connected with the steel industry or the non-ferrous metals. The reason for this is that the book is con-

cerned largely with the operating principles and methods involved in running a large plant, and these methods and principles are applicable in the broader sense to any industrial organization. To be sure they apply more directly to the particular industry covered, but every progressive plant foreman, superintendent, manager and metallurgist should be familiar with the types of layouts, the methods of material storage, and material handling, and the factors of all sorts which enter into the operation of every manufacturing establishment. We can heartily recommend this book as a reference work for any technical library.

Among the topics covered are the following:

Location of the Steel Works in Relation to Other Plant.

Relative Location of the Individual Departments (such as raw material and furnace material stores, melting shop, casting bay, molding shop, etc.).

Details of Equipment (such as buildings, furnaces, gas producers, auxiliary machinery for transportation, loading and unloading, and scrap packaging).

A good bibliography is included.

Arc Welding and Cutting Manual. Published by the General Electric Company, Schenectady, N. Y.

This is a 127-page volume, bound in cloth, issued by the General Electric Company under the designation Y-2007. Its purpose is "to acquaint the uninformed in a general way with some of the applications of arc welding, and to provide a simple and logical method by which one may acquire a certain familiarity with the manipulation of the electric welding arc and its characteristics."

The volume is profusely illustrated with photographs, diagrams and charts explanatory of the text. It is divided into three parts, the first devoted to general information on arc welding, the second to a training course for operators, and the third giving a number of applications of arc welding. The manual should prove very valuable in practically all industries and trades. It is being distributed at a nominal price.

Technical Papers

The Physical Properties of Foundry Sands. By C. A. HANSEN.*

This paper discusses the data of an investigation carried on in an endeavor to correlate most of the measurable properties of a few simple foundry sands, on the principle that a fairly intimate knowledge of a few sands is more useful than a heterogeneous mass of isolated data covering a great many sands. The following properties were studied: green bond (Doty Test), green compression strength, dry cross-bending and dry compression strength, green and dry permeabilities and green and dry densities. The author concludes after reviewing the test results that: (1) green strength is primarily a surface tension affair. Numerically it is a measure of the amount of increased water surface created by the displacement of the sand grains during rupture of a core. It is often confused with viscosity, as in the case where various organic binders are added to core sands to give them apparent strength. Green strength may determine molding characteristics; but rather in the way that high green strength involves sand that will not flow laterally beneath a rammer and thus leads to non-uniformity rammed molds and scabbed castings. It has no bearing upon the capacity of the mold to withstand the action of molten metal. (2) Dry strength determines the capacity of a mold to withstand molten metal. This is true of green sand molds as it is of dry sand molds.

Recrystallization and Grain Growth in Soft Metals. By Maurice Cook and Ulick R. Evans, Cambridge, England.¹

A procedure of obtaining specimens of lead, tin and cadmium with a moderately equiaxed structure and a smooth surface suitable for etching without grinding and polishing is described; the advantages of general oblique illumination (as opposed to vertical illumination) in the photomicrography of pure metals are stated. Using these methods, a statistical

study of the changes brought about in deformed lead, on annealing, has been made. The common mode of structural change was found to be recrystallization. Cases of growth of one original grain into another were rare; but if a totally recrystallized specimen was annealed above 200° C., a few large grains appeared and spread over the whole area, except for a certain number of small grains which remained unabsorbed. The temperature needed to produce structural change in lead was found to be lower, the greater the degree of deformation. With tin, an extension of 28 per cent caused practically no recrystallization at ordinary temperatures, but recrystallization occurred if the specimen was heated to 100° C. In cadmium at low temperatures, the grain size decreased in marked manner as the deformation increased; but at high annealing temperatures, the grain size was comparatively independent of the degree of deformation.

Determination of Structural Composition of Alloys by a Metallographic Planimeter. By E. P. Polushkin, New York.¹

The object of this paper is to show that the structural composition of an alloy may be found by the planimetric measurement of the total area occupied by each of the constituents on a few representative photomicrographs of this alloy. When the area is determined the volume and the proportional weight of the constituent may be calculated. This method has been used for the determination of the structural composition of binary eutectics and other binary alloys with known constituents; also the unknown constituents in binary alloys.

Zinc Used for Roofing. By Chas. E. Van Barneveld.²

The information presented in this report is a by-product of studies concerning zinc, and is published in response to inquiries for information as to the suitability of zinc for roofing.

¹ Abstract of a paper to be read at the New York meeting of the Institute of Metals Division, February, 1925.

² Serial No. 2,632. Reports of Investigations, Bureau of Mines, Washington, D. C.

*A paper presented at the Milwaukee Meeting of the American Foundrymen's Association, October 11-16, 1924.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { WILLIAM J. REARDON, Foundry
JESSE L. JONES, Metallurgical

PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical
WILLIAM J. PETTIS, Rolling Mill R. E. SEARCH, Exchange-Research

ALUMINUM ALLOY

Q.—Do you know of an aluminum alloy that will show a Brinell test of between ninety and one hundred?

A.—An alloy of 88¼ Aluminum
10 Copper
1¼ Iron
½ Magnesium

will give you a Brinell hardness of ninety to one hundred.—W. J. R., Problem 3,318.

CARBONIA BLUING

Q.—I wonder if you would kindly give me your advice upon the method used by us in Carbonia Bluing. Our present method is easy, and from a standpoint of labor comparatively cheap. We load up furnaces with spool ends, put in the necessary quantity of granulated bone and carbonate oil. The length of time of the run is usually determined by the quantity of gas burnt rather than the temperature, and the length of time held at that temperature. Please criticize the above procedure.

A.—The methods you use in the production of carbonia blue is the usual procedure for such a process. We can suggest no methods for improvement. The success of any such methods depends to a great extent upon the basic steel surface, which should at all times be clean, and free from oxidation, rust, etc. The success of all coloring or plated deposits upon steel depends upon a uniform metal surface at all times under such conditions. You should not experience any difficulty with the process you now operate.—C. H. P., Problem 3,319.

COLORING BRASS BLACK

Q.—Will you please give us a good formula for a dip, for making sanded brass and bronze hardware black. Some time ago our plater noted that other manufacturers used some kind of a dip for their brass and bronze hardware. They just dipped the hardware 2 or 3 times and then brushed it, it came out a dull black. We frequently have to match up some of their black hardware, but we cannot get results from our plated black nickel.

A.—The majority of hardware firms use the lead acetate hyposulphite solution for the production of sanded brass and bronze antique finishes. Try the following solution, which should be used in a cast iron kettle:

Water	1 gal.
Hypsulphite of soda.....	8 ozs.
Lead acetate	4 to 8 ozs.

Temperature 180° F.

Quite frequently in connection with the above a dilute hot polysulphide solution is used to immerse the articles in, after thoroughly washing in cold water:

Water	1 gal.
Polysulphide	¼ oz.

Temperature 160° F.

You can decide whether it is necessary to use the polysulphide dip.—C. H. P., Problem 3,320.

DIPPING ROOM FLOOR

Q.—We are about to move into a new building and want to have you give us some advise about our dipping room. We saw an answer to a problem of making the dipping room floor in one of your previous issues which also recommend acid proof brick to be laid edgewise and filled in between with asphalt. If you have anything else to recommend we would

be glad to hear of it. We would also like to know what is the best material to use for the waste piping that carries off the waste to the sewer. We have had a lot of trouble with this and have had to replace the pipes many times.

A.—The answer we gave relative to acid dipping house floors is essentially correct and in our opinion, gives the best flooring results. The alternative would be to use reinforced cement and coat with a boiling mixture of asphaltum mastic compound.

Ordinary brick could be used as the base and then the asphalt compound applied if so desired. The results would be satisfactory.—C. H. P., Problem 3,321.

FUSIBLE METAL

Q.—Kindly send me a formula for a low fusing die metal, that will melt in hot water. It should be hard to withstand hammering without showing any wear.

A.—The only metal we know of that will dissolve in boiling water, consists of bismuth, two parts; lead, one part; tin, one part. This alloy will melt at 200° F.

Another alloy called expanding alloy which melts at 150° F. consists of 66.7, lead; 8.3, bismuth; 25, antimony. It may answer your purpose.—W. J. R., Problem 3,322.

GUN METAL BLUE

Q.—How can I get a gun blue on revolvers?

A.—To produce a gun metal blue finish such as the gun manufacturers produce on their products, it will be necessary to polish the revolver parts to a good lustre, then cleanse them with gasoline to remove the grease, etc.

A molten solution should now be prepared in an iron pot or kettle consisting of sodium or potassium nitrate sufficiently so that the parts to be gun metal finished can be completely submerged.

To every pound of sodium or potassium nitrate add ½ to 1 oz. black oxide of manganese. Heat the mixture to 700° F., and immerse the parts to be finished until they become the color desired. Afterwards cool immediately in water; dry out in boiling water and sawdust.

Then apply a thin coat of beeswax dissolved in turpentine with a piece of Canton flannel.

If only a blue finish is required, then sea-sand could be heated to 500° F., and the parts to be blued imbedded in the sand until sufficiently blued.—C. H. P., Problem 3,323.

METAL MIXTURES

Q.—Kindly give me some information on the mixture of red brass, yellow brass, bearing bronze, acid resistance bronze and aluminum casting alloy.

A.—No. 1. Red brass: 85 copper, 5 tin, 5 lead, 5 zinc.
No. 2. Yellow brass: 72 copper, 1¼ tin, 6 lead, 20¼ zinc.
No. 3. Bearing bronze: 80 copper, 10 tin, 10 lead.
No. 4. Acid resistance bronze: 90 copper, 10 tin.
No. 5. Aluminum casting alloy: 91 aluminum, 8 copper, 1 silicon.—W. J. R., Problem 3,324.

NICKEL OR TIN DIP

Q.—We have searched through your magazine, trying to locate a formula for a nickel dip. We do not want to electroplate, but want a cheap dipping process, that will protect from rust for awhile. If this can not be done with nickel what other white metal can be used, that would also be harmless if touched with a food product.

A.—Nickel-plating by a simple dip without the use of an

electro-plating nickel solution, will not in our opinion, give you the results you desire.

You can try the following formula:

Water	1 gallon
Nickel chloride	8 ozs.
Sal-ammoniac	8 ozs.

Heat the solution to 180° F. Immerse the articles in the solution by the aid of an aluminum perforated pan or sieve. This solution will work upon brass. We are unable to determine whether the same results can be obtained upon steel.

If a thin coating of tin will be satisfactory for your purpose, the following solution may be used:

Water	1 gallon
Ammonia alum	4 ozs.
Tin crystals	1 oz.
Temp. 180° F.	

Immerse the articles in the solution by the aid of a perforated sheet zinc pan or sieve. Move the articles at intervals during the tinning operation. A deposit will result in a few minutes. Afterwards, wash the articles in cold and boiling waters, and dry out in hard maplewood sawdust.—C. H. P., Problem 3,325.

POOR BRASS CASTINGS

Q.—We are taking the liberty of asking your help in overcoming some trouble that we are having with brass. The alloy that we are making is two to one, and we are using a small quantity of aluminum with this, say about two ounces to the hundred pounds. The copper that we use is Calumet and Hecla, and the zinc is special brass spelter.

Our castings look well enough, but when we come to finishing them, they do not turn freely, nor are they homogeneous as they should be for our work. The class of work that we do is a general jobbing, a good deal of the product of our foundry is used for ornamental work, such as book ends, and the like, and these, upon being polished show small pores in the surface of the metal.

If you will be so good as to tell us, if you can from the foregoing, what is incorrect in our procedure, or the metal that we use, we would greatly appreciate it. Also, if it is not inconsistent with your policies in matters of this kind, will you please give us what you consider a suitable formula, together with such necessary directions for its manipulation as you can.

A.—In a mixture of two copper and one zinc, fluxed with aluminum, if there is no lead added to the mixture, you should not have such trouble. However, if you have lead in your mixture you can look for such trouble. The remedy, if your metal is 2 & 1 and no lead, is to look to your molding and see that the sand is used as dry as consistent, to mold clean, and not to ram too hard. However, if lead and aluminum are present, you will have trouble until you eliminate the lead. While you do not say you have lead present in your mixture, the trouble you speak of indicates it.

We think the foundry loses a lot of money trying to cheapen its mixture by the use of zinc, and we suggest for a line of work such as book ends, etc., 76 copper, 20 zinc, 1 tin, 3 lead. This mixture will run clean and give nice castings and what the metal costs over 2 & 1, will be saved in labor and trouble.

If you want a yellow brass that is cheap and similar in color and strength to manganese bronze, the following will give you very good results: 58½ copper; 41 zinc; ½ aluminum. Get the copper good and hot and add the zinc a little at a time; stir well.—W. J. R., Problem 3,326.

REFINING TIN

Q. From time to time I am offered small lots of native tin that contains quite a lot of impurities. It is stream tin brought in by the natives who operate on a small scale and use primitive methods of smelting. Although they stoutly deny it, I think they mix scrap babbitt with it sometimes, for some of the assays show a percentage of lead and antimony.

How can I test it when I buy it to get an idea of the amount

of impurities it contains? I have no laboratory at my disposal but could buy some of the simpler apparatus if I knew how to use them. Also I receive orders occasionally for liners valves, valve ports, etc., for repairs to a compressor used for sulphuric acid gas at the dynamite plant.

A. One of the simple methods of refining tin would be to do as the scrap smelters do—run the metal through a sweating furnace. Or in your case, with only a small amount of impurities, melt the tin in a large iron pot, one holding approximately 3000 lbs., and pole or boil the tin, by inserting a raw potato to the bottom of the pot and add sulphur and salammoniac, a few handfuls at a time. The mixture of salammoniac and sulphur should be fifty percent of each. Boil the tin, skim and pour in long strips. If pure tin the metal will have a yellow tint and when bent will make a sound called the "cry of tin." There is no simple method for analyzing your tin for small amount of impurities.

One of the best mixtures for liners for valves is composed of 78 Copper, 7 Tin, 15 Lead. Use new metal and keep the metal free from oxides.—W. J. R., Problem 3,327.

REVERBERATORY FURNACE BED

Q.—We are subscribers to your journal and would appreciate it if you could suggest to us a suitable mixture for the bed of a reverberatory furnace used for melting scrap copper.

A.—The bottom of a reverberatory furnace is composed of a solid mass of fire brick in the standard sizes or in heavy block. The thickness varies with the size of the furnace, from four to six feet in the case of ordinary size furnaces, and twelve feet in larger furnaces. It must be very closely laid. If this is not done, or if the joints are not properly broken, the molten metal tends to seep through the cracks and an enormous amount may escape from the hearth. The high grade fire brick are underlaid by a brick of cheaper grade and this in turn by concrete in a deep and broad foundation give absolute stability.

One of the best types of copper furnaces for melting scrap copper is built in a pan supported by rails twelve inches apart. Lay one layer of common fire brick on the flat and cover with a thin grout of good fire clay; then cover with a layer of magnesia cement and one layer of brick on end, of the best silica brick you can find. At the ladle hole and under the flue use magnesia brick.

If you want only to ram a bottom on your brick bottom, we suggest a mixture of five parts carborundum fire sand, one part German clay made up and kneaded into balls and rammed in 6" thick, which will give very good results.—W. J. R., Problem 3,328.

RUST-PROOF NICKEL

Q.—Will you please state for our benefit the best process for nickel plating steel and iron automobile parts so as to make them rust proof; also, if copper-plating before nickel-plating is of any benefit?

Water	1 gal.
Single nickel salts	28 ozs.
Nickel chloride	4 ozs.
Boracic acid	3 ozs.

Voltage 5. Temperature of solution 120° F.

Copper solution:

Water	1 gal.
Sodium cyanide, 96-98%	7 ozs.
Copper cyanide	6 ozs.
Soda ash 58%	¾ of an oz.
Powdered borax	¾ of an oz.
Hyosulphite of soda	5 grains

Temperature 120° F. at 4 volts. First: Coat the steel in the nickel solution at 25 amperes per sq. ft. for 5 minutes. Second: Wash thoroughly and plate in copper solution for 15 minutes. Third: Buff the copper to a lustre, then cleanse and plate in the nickel solution for 30 minutes. The results will be a rust-proof nickel deposit on steel.—C. H. P., Problem 3,329.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,517,910. December 2, 1924. **Plant for Electroplating Metal.** Felix Kirschner, Vienna, Austria.

A plant for electroplating metal comprising an electroplating cell, means for applying an adhesion flux to the electrolytically deposited coating, means for fusing said coating on to the metal by aid of the adhesion flux and means enabling the molten coating to cool while setting.

1,518,190. December 9, 1924. **Method of Casting Hollow Ware of Aluminum.** Howard Emery, Detroit, Mich., assignor to The Chas. B. Bohn Foundry Co., Detroit, Mich.

The process of forming hollow castings of aluminum and like metals, which consists in first forming a green sand core upon an arbor, engaging said arbor with a seat therefor in an outer mold, whereby the core is suspended within the mold cavity of said outer mold and in filling the mold cavity with the molten metal.

1,518,321. December 9, 1924. **Aluminum Alloy.** André Geyer, Paris, France.

A process of manufacturing an aluminum alloy containing copper, manganese, magnesium and lead which comprises maintaining the mixture molten while protected on its surface by a layer of finely divided carbon containing material and stirring the metal while so protected to cause the carbon to enter the metal.

1,518,622. December 9, 1924. **Rust-Resistant Plated Article.** Christian John Wernlund, Tottenville, N. Y., assignor to The Roessler & Hasslacher Chemical Company, New York, N. Y.

As a new article of manufacture, a ferrous article having an electrolytic coating comprising zinc together with 2 per cent or more of cadmium.

1,518,760. December 9, 1924. **Aluminum Nickel Alloy.** Joseph M. Schwartz, New York, N. Y.

The within described alloy, composed of aluminum in a relatively large amount, and relatively small amounts of copper and nickel, the percentage of the aluminum being ninety or more, and the percentages of the copper and nickel being in the proportion of two to one.

1,519,058. December 9, 1924. **Process of Melting Metals.** Wilhelm Rohn, Hanau, Germany.

A process for melting down cold scrap in pieces in induction furnaces, characterized by a voltage several times greater being produced in the charge of the melting groove for the purpose of starting the heating and the melting, by supplying primary alternating current of a higher frequency than the normal one.

1,519,204. **Process for the Regaining of Metal from Metallic Chippings.** Karl Hess, Heilbronn, Germany.

A process of recovering light metals from chippings, residues, ashes, etc., by melting the said material with salts, the said material being gradually introduced in small quantities into a bath of molten salt.

1,519,377. **Alloy.** Ernest G. Jarvis, Paterson, N. J., assignor by mesne assignments, to Merco Nordstrom Valve Company, San Francisco, Calif.

An alloy consisting of the following metals taken within the limits of approximately the proportions given: tin 1 to 3 per cent; lead 1 to 4 per cent; iron 2 to 6 per cent; copper 60 to 65 per cent; nickel 22 to 28 per cent; zinc 8 to 12 per cent.

1,519,455. **Briquetting Machine.** Marius P. Jacomini and Ladislav F. Kristufek, Cincinnati, Ohio.

In a press having means for applying pressure, a movable die carrying structure carrying a plurality of open ended dies, means for bringing said dies successively into and out of operative relation with said pressure applying means, means for yielding supporting said dies in said die carrier, means bearing against the lower end of said dies for preventing the escape of material before compression, and means for permitting said bearing means to yield responsively to the yielding movement of the dies.

1,519,572. **Electroplating.** Albert Wolf, Geislingen-Steige, Germany, assignor to Württembergische Metallwarenfabrik, Geislingen-Steige, Germany.

The method of depositing by electrolysis in a single opera-

tion a metal layer of non-uniform thickness on a predetermined part of an object immersed in the electrolyte, consisting in preventing the current lines passing from the anode to the cathode to act upon any but the predetermined parts of the object.

1,519,577. **Cleaning and Abrading Device.** Henry P. Easton, Jr., Denver, Colo.

A scouring pad of the character described comprising a back of textile fabric flexible in all directions, a mass of metallic wool applied to the back and stitched thereto at a plurality of points, one end of the back being extended to form a handle, and flexible strips extending longitudinally and transversely over the face of the metallic wool and stitches extending through the flexible strips and metallic wool and holding the flexible strips to the back, the ends of the strips being stitched to the back.

1,519,724. **Apparatus for Making Lead Pipes.** Frank B. Ewell, Rochester, N. Y.

In a lead pipe machine, the combination of a pipe making device, capable of making lead pipe, a spool over which the pipe passes from the plunger when made, a winding apparatus for winding up the pipe, a controlling mechanism for said winding apparatus and operated by the weight of a predetermined length of the lead pipe formed by said pipe making device and stretched between said pipe making device and said winding apparatus.

1,519,862. **Metal Alloy.** Barnett Wright Macy, Jacksonville, Fla.

A metal alloy composed of copper, uranium, manganese and nickel in substantially the proportions stated.

1,519,907. **Cleaning and Polishing Composition.** Albert Edmondson, Ware, Mass.

A liquid composition adapted for cleaning and polishing purposes consisting of Glauber salts and glycerine.

1,520,033. December 23, 1924. **Alloy.** Stuart Eban MacGregor, Windsor, Ontario, Canada.

An alloy containing nickel and cobalt, not varying, jointly, widely from 40 per cent of the total, each being present in substantial amount; chromium and tungsten, each not varying widely from 30 per cent; and carbon, in appreciable amount.

1,520,676. December 23, 1924. **Rim-Plating Machine.** Harry K. Koppin, Jackson, Mich., assignor to General Motors Corporation, Detroit, Mich.

In an electro-plating machine of the class described, a tank adapted to contain a plating solution; a movable carrier, and means for moving the same; a plurality of work carrying devices supported by said carrier and movable relative thereto, and having each a work supporting member arranged to move along and over said tank and adapted to suspend an article to be plated.

PATENT LITIGATION

The U. S. Circuit Court of Appeals for the Sixth Circuit has affirmed the decision of Judge Westenhaver in the U. S. District Court for the Northern District of Ohio, upholding the Johnson patent No. 1,030,890, owned by the **William Cramp & Sons Ship and Engine Building Company**, and holding that the patent is infringed by the balanced valve manufactured by the **Wellman-Seaver-Morgan Company** of Cleveland.

The suit brought by **Brown Instrument Company** in the Federal Court at Chicago against **Republic Flow Meters Company** and certain individuals has been settled between the parties; also certain suits at law brought by **Republic Flow Meters Company** and the same individuals in the same court against R. P. Brown have been dismissed. It was called to the attention of the Republic company that certain patent applications were pending, on behalf of **Brown Instrument Company**. The **Republic Flow Meters Company** has changed the construction of its indicating and recording pyrometers to avoid any question of infringement patents, original designs or construction of the **Brown Instrument Company**.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

ANACONDA-FLINTKOTE COPPERCLAD ROOFING

Anaconda-Flintkote Copperclad Strip Shingles were developed to meet the demand for a roofing material at moderate cost, capable of resisting for long periods ordinary deteriorating influences and combining a high degree of fire resistance with unusual architectural beauty.

Experimentation and research work over a period of two years convinced the Anaconda Sales Company and The Flintkote Company, both of New York, that a base of felt impregnated with asphalt, a layer of dense fire-resisting material such as crushed slate imbedded therein, and a surface covering of pure copper would be an ideal roofing material.

The copper coating functions as follows:

1. It prevents the volatilization of the lighter oils in the asphalt, thereby greatly increasing the life of the base.
2. The copper covers the slate and enters the interstices between the particles of slate; therefore the slate is more securely held in place.
3. The exposed edges of the felt are copper covered. This acts as an "L", increasing enormously the rigidity of the shingle.
4. The copper sheet takes the "wear." Copper will not corrode under atmospheric conditions.
5. While copper itself is an excellent roofing, modern residential design requires thickness. Slate surfaced asphalt roofing is used to give this effect.
6. From an artistic standpoint, Copperclad is a most satisfactory roof. The surface has pleasing texture, the copper having a slight green patina.
7. Copper has a high melting point, about 1900° F. This affords good protection to the base against flying embers.

MANUFACTURE

Copperclad Shingles are manufactured by the Anaconda Copperclad Company at Rutherford, N. J. The strip shingle base is produced by the Flintkote Company. Rigid inspection of the felt and the asphalt is exercised and the most exacting specification is given strict interpretation.

The surface of the crushed slate is treated so as to be electrically conducting. The shingles are then passed through a bath where copper is deposited electrolytically. This art is known as galvanoplasty and differs materially from ordinary electroplating. The thickness of the copper coating is determined by the current in the bath and is under absolute control. A uniform product is assured because every step in the process is so controlled that there cannot be any variance in quality or appearance.

By virtue of the process by which the copper is applied to the base, the metal must be absolutely pure and it is safe to state that never before has copper running 99.99% pure been used for roofing purposes.

Every step in the manufacturing operation is under unified control. Each run is rigidly tested and inspected and every shingle must measure up to a high standard.

INSTALLATION

Complete directions for installation can be obtained from the Flintkote Company.

FLASHINGS

Anaconda-Flintkote Copperclad Flashing material comprises a backing of asphalt impregnated felt, 72" long by 18" wide on which is superimposed a strip of copper 72" long and 12" wide so placed that there is a selvedge edge of 3" on each side of the copper. Starting strips, valley strips, ridges, hips, under flashings and cover flashings are all cut from this sheet and the selvedge edge makes possible a felt to felt joint, thus obviating the necessity of soldering.

TESTS

Copperclad Shingles were tested by the Underwriters' Laboratories, Inc., and were granted the highest rating—Class A roof covering.

Copperclad Roofing products are distributed exclusively by The Flintkote Company, Boston, New York and Chicago. The Flintkote Company is the exclusive licensor for all Copperclad roofing patents.

PLATINUM ALLOY TESTS

Sigmund Cohn, 44 Gold street, New York, is putting on the market a new platinum testing method called the Plat-Tester.

The principle on which the Plat-Tester test for purity of platinum is based, is that different combinations of metals dissolve in Plat-Tester acid at various rates of speed.

If a piece of each of the following is taken:

- Iridium platinum
- Pure platinum
- Palladium platinum, containing a low percentage of palladium
- Palladium platinum, containing a high percentage of palladium
- Pure palladium

all of the same size and thickness, put them in to a dish, fill it with Plat-Tester acid and heat the dish, the piece of pure palladium would dissolve and disappear almost instantly. Next, the palladium platinum alloy containing a high percentage of palladium would dissolve and disappear. Next, the palladium platinum alloy containing a low percentage of palladium. After that the piece of pure platinum would dissolve and disappear, and finally the piece of iridium platinum would also dissolve.

If instead of putting these pieces into a dish and heating them with Plat-Tester acid, a short streak of these same metals is rubbed on a black testing stone, taking ordinary care that the various streaks are made with about the same degree of rubbing, then place enough Plat-Tester acid on the stone to cover all the streaks and heat the stone, a similar result will be obtained. The pure palladium streak will disappear first.

Next, the palladium platinum containing a high percentage of palladium. Then the palladium platinum alloy containing a low percentage of palladium will disappear. Then the pure platinum streak will disappear, and finally the iridium platinum streak will disappear.

It will noted from the above explanation, that while all the combinations of platinum used for manufacturing jewelry, will dissolve in Plat-Tester acid the length of time in which they dissolve increases as the purity of the platinum increases, and this fact enables us to test the purity of platinum by the Plat-Tester method.

COMPOSITION OF PLAT-TESTER ACID

Plat-Tester acid is made up as follows: one part conc. nitric acid, three parts conc. hydrochloric acid. This mixture evolves chlorine gas, rapidly at first, more slowly as the acid becomes older. This gas dissolves in the solution and the acid is good for testing purposes as long as it is present. After six to twelve months the evolution of gas ceases and the acid must be replaced in order to insure accurate results. When testing acid is first prepared gas is evolved too rapidly to be absorbed by the solution. This gas has a disagreeable odor and the bottle of testing acid should be left in the open air (for instance outside a window) with the stopper off 24 hours or longer before being kept indoors. Do not fill the bottle more than two-thirds full, otherwise some of the acid may spill if the bottle is shaken. Plat-Tester acid should be kept in a cool place, away from sunlight.

It is necessary to make a preliminary and a secondary test. A full description of these tests can be found in a booklet published by Sigmund Cohn.

NEW AIR DEVICES

The Paasche Air Brush Company, Chicago, Ill., has recently sent out a circular describing ten Paasche air devices among which are the following five new products:

The **Type L** sprayer is designed for a quick spray for finished work or for rough surfaces, castings, etc.; also for finishing popular, low-priced commodities.

The **Type G** air brush is used for longer jobs where higher priced fluids are applied, requiring better control. Platers using lacquers or other liquid materials



FIG. 1. CUP TYPE L SPRAYER.

in small quantities should be interested in it.

The **Type GE** electric brush is used for hot applications, such as paraffin, glue, butter, wax, lard, etc. An electric heater keeps the materials at the desired temperature.

The **Type P** powder brush is designed for applying dry powders to adhesive surfaces; bronz-

ing to statuary, novelties, etc.

The **Electric Portable Painting Unit** can be carried from job to job in the plant or outside. It is a complete air brush painting unit.

In addition to the equipment described above the Paasche company manufactures a complete line of painting, spraying and other equipment, including the following types: air brushes; finishing equipment; air compressors; pneumatic rubbing machines; air conditioning



FIG. 3. TYPE G AIR BRUSH.

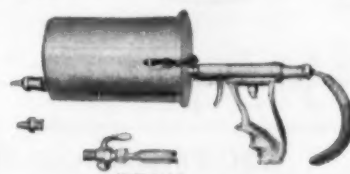


FIG. 4. TYPE P POWDER BRUSH.

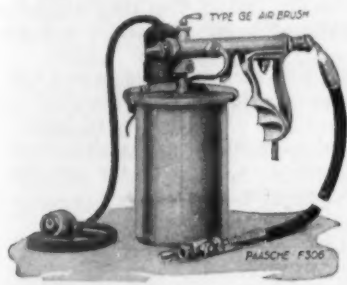


FIG. 2. TYPE GE AIR BRUSH.

units; portable painting machines; automotive oiling, cleaning and washing equipment; sand blast equipment. The main office is in Chicago, Ill., but branch offices have been established in Cleveland, Ohio, and New York.

NEW BUFFING MACHINE

A new electrically driven Double Independent Spindle Polishing and Buffing Machine has been placed on the market by The P. A. Geier Company, Cleveland, Ohio. This machine has many new features, which will be recognized as different from the usual machine of like class, that are very desirable.

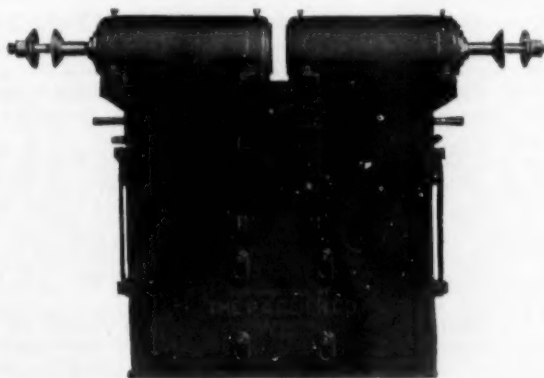
The base of the machine is of heavy box section cast iron construction and forms a housing for the motor, idlers and the brake mechanism as well as the control box.

The motor is of the squirrel cage type and is mounted on a sub-base which is hung on the internal front side of the base. Up and down motion or adjustment of the motor is provided to compensate for the stretching of endless belts that drive the spindles. The spindles are stopped or started by the use of idlers which are mounted on annular ball bearings and the belt tension is obtained by the use of counter weights. The idlers with counter weight are operated by a hand lever, located on the outside of the machine as shown. Through the manipulation of these levers either spindle may be started or stopped at will by the operator. This external hand lever by the same motion also operates a raybestos lined toggle brake which stops the spindles and locks them for the purpose of changing wheels, the brake itself being of generous proportions. The spindle head is of one piece cast iron construction to assure proper alignment. The spindles are of hy-ten steel, two and one-quarter inches in diameter and are mounted on very large annular bearings.

A system of dust baffles is used to keep the bearings dust proof and the use of felt washers is, therefore, eliminated. The spindle housing, brake, pulleys, and belt are housed within a sheet

metal hood as shown. The electrical controller is enclosed in a separate case fitted within the body of the machine and is dust proof.

Power is controlled by push buttons located conveniently on



GEIER BUFFING MACHINE

the upper part of the base. Speed variation from 1800 to 3000 R.P.M., is obtainable by the use of driving pulleys of varying sizes. One spindle can be operated at one speed and the other at a different speed, if desired.

These machines are offered with 5, 7½ and 10 H.P. motors.

REFRACTORY CEMENT

E. J. Lavino & Company, Philadelphia, Pa., are placing on the market a new refractory cement called Kromepatch. The base of Kromepatch is a natural refractory which, it is claimed, has an established reputation, particularly in the open hearth steel industry, for its chemical and physical stability in the presence of nearly all destructive forces encountered in the various furnace types and practices. The annual consumption of this chemically neutral, highly refractory ore in the open hearth industry ranges 25,000 to 50,000 tons.

In the metal industry Kromepatch is said to be meeting with unusual success as a coating for the walls of coke and oil fired pit furnaces; for laying brick in all types of furnaces and for bonding crushed fire brick or Neutragrog (a properly sized, granular material, made of the same ore used in Kromepatch) in making rammed-in linings.

Being so nearly neutral, chemically, a coating of Kromepatch or a monolithic lining of Kromepatch and Neutragrog does not react chemically with ash and clinker in the coke furnaces or

impurities in the oil, metal or slag, all of which readily attack most fire clay brick. In the oil fired furnaces where they have installed monolithic linings of Kromepatch and Neutragrog there is said to have been no sign of fusion; in fact, they have not yet found an installation where the temperature was sufficiently high even to glaze the surface of this type of lining. Long runs have been made with these linings, careless handling of tongs and crucibles being responsible for most of the patching and ultimate replacement.

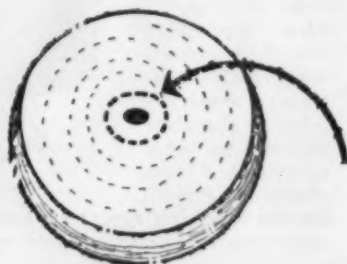
Kromepatch is claimed to be superior to any silica or fire clay cement for laying the silica brick in a reverberatory roof, and also equally satisfactory for laying magnesia or chrome brick in other parts of the furnace, although silica bricks are acid and magnesia bricks, basic. Therefore Kromepatch may be employed in settlers, ladles, copper blast furnaces, reverberatories, roasting furnaces, boiler furnaces and almost any other type found in smelting plants.

The manufacturers state that Kromepatch is sold under a positive guarantee of satisfaction or they cancel the invoice.

RED CIRCLE BUFF

The Schwartz Manufacturing Company, Two Rivers, Wis., is manufacturing a line of buffing and polishing wheels, and specialize in the manner in which they sew their buffs. All buffs, both loose and sewed, have one single row of stitching with red thread around the arbor hole. This is the trade mark, and permanently identifies their buff no matter how long it has been used.

The thread used in the sewing is made of the best quality



RED CIRCLE BUFF.

of Sea Island Cotton thereby insuring long life and sturdiness. The sheeting used comes from Southern mills in a very fresh state, and is manufactured and shipped as finished buffs before the cloth has any chance of deteriorating in strength or quality.

The Schwartz company states that there is no patented process by which these buffs are made, and all that they are doing is making a regular old-fashioned buffing wheel in a better and more modern way.

Their line consists of both full disc loose and sewed buffs made out of the various grades of sheeting, both bleached and unbleached. They also make a line of pieced sewed buffs of the very highest quality, and they also have a department which manufactures special orders of buffs to the specifications of different concerns.

EQUIPMENT AND SUPPLY CATALOGUES

Canario Copper Company—A booklet, issued by Cameron, Michel & Company, New York City, containing information on their various mines.

Sand Riddle—The Buckeye Products Company, Cincinnati, Ohio, has published a folder on its improved lumpbreak sand riddle for riddling sand.

Plating Dynamos—Interpole dynamos are described and illustrated in a folder issued by the Hanson & Van Winkle Company, Newark, N. J.

Railroad Calendar—A calendar from the New York Central Lines, illustrated by a large colored picture of the Twentieth Century Limited at full speed.

Electric Equipment—Bulletin No. 48732, published by the General Electric Company, Schenectady, N. Y., describes and illustrates electric equipment for cranes.

Brass and Copper Pipe—The American Tube Works, Boston, Mass., has issued a folder on its green label guaranteed seamless brass and copper pipe for plumbing and steam work.

Shipping—Proceedings of the Fifth Regular and First Annual Meeting of the Atlantic States Shippers Advisory Board, held at the Hotel Commodore, New York, January 7-8, 1925, issued by that organization.

Air Classifiers—Bulletin No. 17 has been issued by the Hardinge Company, New York City, covering the rotary air classifier, the combined rotary and superfine classifier, for use with Hardinge conical mill.

Copper Stocks—A statistical summary of the copper producing companies recommended for investment by the Cameron, Michel & Company, New York, copper investment specialists, engineers and operators.

Electric Power Apparatus—Bulletin No. 861, issued by Electric Machinery Manufacturing Company, Minneapolis, Minn., covering synchronous motors for pumping. It is well illustrated, and includes a sheet of applications of E-M synchronous motors.

Appraisals—"The American Appraisal News" is the title of booklet No. 1, Vol. X, issued by the American Appraisal Company, Milwaukee, Wis., containing among others, the following chapters: President's Message; A New Year Appraisal; Building Materials and Labor During 1924.

Hardness Testing—Bulletin No. 27, issued by Herman A. Holz, New York City, contains the following subjects on hardness testing of metals and metal products: The Best Method; The Best Machine to Apply the Best Method; The Best Accessories to the Best Machine.

Sand-Cutting Machines—The American Foundry Equipment Company, New York, has issued an attractively bound catalog (No. 680) on American sand-cutting machines for foundries, which are said to cut, mix, blend, aerate, cool and pile the foundryman's "pay-dirt." It is also well illustrated.

Oakite—A folder, issued by the Oakley Chemical Company, New York, telling the story of the savings possible by the use of Oakite for metal cleaning purposes. It features H. C. Bernard of Rochester, N. Y., and his work. Another folder shows the portraits and locations of all the Oakley service men.

Portable Electric Tools and Shop Equipment—Catalog No. 8, issued by Black & Decker, Baltimore, Md., covers their portable electric drills, grinders, valve grinders, tappers, screw drivers, socket wrenches, post and bench drill stands, electric bench and pedestal grinders. An attractive booklet.

Brass and Metals—A book entitled "Fifty Years," covering the history of the More-Jones Brass & Metal Company, St. Louis, Mo., from 1874-1924. The book is handsomely bound in bronzed covers profusely illustrated and is an interesting story of the development of a prominent metal company.

Unit Heaters—Bulletin No. 1218 has been published by the American Blower Company, Detroit, Mich., describing and illustrating a Venturafin heating unit, having about three times the heating capacity of the original Venturafin unit heater, which was placed on the market last year. A folder has also been issued containing various installations of the American blower direct fired heater.

Non-Oxidizing Annealing Furnaces—Bulletin No. 95 describes and illustrates Kenworthy non-oxidizing annealing furnaces, used for annealing metals without oxidation. Briefly, these furnaces consist of annealing chambers resembling mammoth inverted bottles with their mouths sealed in tanks of water over which the entire heating unit is set. Issued by Charles F. Kenworthy, Inc., Waterbury, Conn.

Business Leaflets—A series of 10 leaflets has been issued by the Policyholders' Service Bureau, Metropolitan Life Insurance Company, New York, on the following subjects: No. 1, Business Control; No. 2, Methods of Organizing Salesmen's Time; No. 3, Sales Budget; No. 4, Control of Material; No. 5, Making the Most of the Small Shop; No. 6, Sources of Cost Information; No. 7, Province of Sales Management; No. 8, The Annual Audit; No. 9, The Cost of Overhead; No. 10, The Significance of the Budget. A very interesting and instructive series.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

INSTITUTE OF METALS DIVISION

HEADQUARTERS, 29 W. 39TH STREET, NEW YORK

The New York Meeting for 1925 will be held on February 16-19, at the Engineering Societies Building, 29 W. 39th street.

Because of the great and growing importance of the subject of Corrosion the Division will have it as one of the chief subjects of its program. Dr. Carl Benedicks, Director of the Metallographic Institute of Stockholm, has accepted an invitation from the Institute to lecture before it on certain phases of corrosion particularly as it relates to boiler tubes. Dr. Benedicks is particularly qualified to discuss the subject from the physico-metalurgical side of the question, and will give the practical engineer some new ideas on the subject.

The program is as follows:

Monday, February 16

9:30 A. M.—Auditorium. Third Floor

New Developments in High-strength Aluminum Alloys—ROBERT S. ARCHER, Metallurgist, Aluminum Company of America, Cleveland, Ohio, and ZAY JEFFRIES, Consulting Metallurgist, Aluminum Company of America, Cleveland, Ohio.

Etching Aluminum and Its Alloys for Macroscopic and Microscopic Examination—FULTON B. FLICK, Metallurgist, Aluminum Company of America, New Kensington, Pa.

Scratch and Brinell Hardness of Severely Cold-rolled Metals—M. F. FOGLER and E. J. QUINN, Development Laboratories, Western Electric Company, Chicago, Ill.

Eutectic Patterns in Metallic Alloys—C. H. GREEN, Assistant in Metallurgy, University of Minnesota, Minneapolis, Minn.

2 P. M.—Room 2. Fifth Floor

X-Ray Evidence versus the Amorphous Metal Hypothesis—ROBERT J. ANDERSON, Consulting Metallurgical Engineer, Boston, Mass., and JOHN T. NORTON, Research Associate, Dept. of Physics, Massachusetts Institute of Technology, Cambridge, Mass.

The Malleability of Nickel—PAUL D. MERICA, Ph.D., Director of Research, The International Nickel Company, New York, N. Y., and R. G. WALTENBERG, Research Metallurgist, The International Nickel Company, Bayonne, N. J.

Recrystallization and Grain Growth in Soft Metals—MAURICE COOK, M.Sc. (Vict.), Ph.D. (Cantab.), King's College, Cambridge, Eng., and ULICK R. EVANS, M.A. (Cantab.), King's College, Cambridge, Eng.

Determination of Structural Composition of Alloys by a Metallographic Planimeter—E. P. POLUSHKIN, Instructor in Metallurgy, Columbia University, New York, N. Y.

6 P. M.—Engineers' Club. Room 4.

Institute of Metals Dinner

Evening Entertainment

8:30 P. M.—Smoker at Cafe Savarin, 42nd Street and Park Avenue

Tuesday, February 17

2 P. M.—Auditorium. Third Floor

Corrosion of Copper Alloys in Sea Water—WILLIAM H. BASSETT, Technical Superintendent and Metallurgist, American Brass Co., Waterbury, Conn., and C. H. DAVIS, Assistant Metallurgist, American Brass Company, Waterbury, Conn.

Tantalum, Tungsten and Molybdenum—E. W. ENGLE, Fansteel Products Company, North Chicago, Ill.

Annual Lecture

4 P. M.—Auditorium. Third Floor

Corrosion Studies: With special reference to Hot Wall Action and Segregation—DR. CARL BENEDICK, Director, Metallographic Institute, Stockholm, Sweden.

SOCIETY OF MECHANICAL ENGINEERS

HEADQUARTERS, 25 WEST 39TH STREET, NEW YORK

RESEARCH TO BE UNDERTAKEN ON THE PROPERTIES OF METALS AT EXTREME TEMPERATURES

A joint committee from the American Society of Mechanical Engineers and the American Society for Testing Materials has undertaken research on the properties of metals at extremely high and low temperatures. Little authentic information on this subject is now available. The objects of this new Research Committee will be (1) to accumulate existing unpublished data on the subject; (2) to make studies leading to standardization of the procedure for listing materials at high and low temperatures; (3) and to outline and foster new research work in this field.

George W. Saathoff, chief construction engineer for Henry L. Doherty & Company, New York City, is chairman of this Joint Research Committee. Other members are: George K. Elliott, of the Lukenheimer Company, Cincinnati; H. J. French, of the Bureau of Standards, Washington; John B. Johnson, of the Air Service, McCook Field; V. T. Malcolm, of the Chapman Valve Manufacturing Company, Indian Orchard, Mass.; John A. Mathews, of the Crucible Steel Company of America, New York City, and LaVergne W. Spring, of the Crane Company, Chicago.

AMERICAN ELECTRO-PLATERS SOCIETY

NEWARK BRANCH

HEADQUARTERS, CARE OF JOHN HEIM, 25 CHESTNUT STREET, NEWARK, N. J.

The Newark Branch of the American Electro-Platers Society will hold its Annual Banquet on Saturday, April 25, 1925, at Achtel Stetter's Restaurant, 842 Broad St.

There will be a very fine afternoon session, at which papers pertaining to the art of electro-deposition will be read and discussed. The committee has obtained some very fine speakers for this occasion and is sure that all those who can possibly attend will feel well repaid. This afternoon session will start promptly at 3:30 P. M., and Librarian S. R. Taylor will conduct the proceedings.

The evening program will include a banquet supper to be served at 7:30 P. M., dancing and entertainers, when several surprises await those who attend. "Newark Knows How" will be clearly proved.

NEW YORK BRANCH

HEADQUARTERS, CARE OF JOHN E. STERLING, 468 GRAND AVE., LONG ISLAND CITY, N. Y.

The New York Branch held its regular January meetings with President Fisher presiding. Richard M. Quinn was elected to active membership. Harvey Miller read a paper entitled "Successful Methods of Electroplating Antimonial Lead," including some phases of chemical analysis. The paper was exceedingly interesting.

John Burke spoke of his experience in electroplating and finishing aluminum die castings, one of the most difficult types of work.

With deep regret the New York Branch announces the death of John Painter, a charter member and a zealous worker. A resolution was adopted by the branch eulogizing Mr. Painter and his service to the American Electro-Platers Society as a whole and the New York Branch in particular.

PITTSBURGH BRANCH

HEADQUARTERS, CARE OF S. E. HEDDEN, 227 FIFTH AVENUE,
ASPINWALL, PA.

As usual, Pittsburgh Branch are always trying to be in the forefront. They have already, at their last meeting, decided to give their 6th anniversary celebration on Thursday, the 14th of April. This will take the form of a free dinner and very highest class moving picture show in the Bureau of Mines Building, Pittsburgh, to all members of Pittsburgh Branch, their families and friends.

The committee has stated that the latch string is always out for all members of the American Electro-Platers' Society on the continent. Every American Electro-Platers' Society man welcome. Everything free!

The high-powered committee behind this movement are as follows: Wilfred S. McKeon, general chairman; S. E. Hedden, secretary; Henry Beck, entertainment; Elliott Corbit, ex-officio.

PROVIDENCE-ATTLEBORO BRANCH

HEADQUARTERS, CARE OF ROBERT CROOK, 185 COUNTY STREET,
ATTLEBORO, MASS.

The seventh annual banquet and ladies' night of the Providence-Attleboro Branch of the American Electro-platers Society was held Saturday evening, January 24, 1925, at the Narragansett Hotel, Providence, with nearly 100 members and guests. Previous to the banquet, which was held at 7 o'clock, there was a society meeting at which addresses were made by E. K. Strachan, Ph.D., professor of physical chemistry at Brown University, on "Colloids"; Augustus P. Munning 2nd, research chemist with A. P. Munning Company, Mattewan, N. J., on "Metal Cleaning Problems," and George B. Hogaboom, consulting chemist, of New Britain, Conn., formerly president of the American Electro-platers Society. Each address was productive of lengthy discussions that were entered into heartily by all the members.

The educational meeting was called to order at 3 o'clock by James Simpson, president of the Providence-Attleboro Branch, who stated that it had been planned to have Charles H. Proctor, founder of the society, officiate as chairman, but a telegram from Mr. Proctor at Dayton, Ohio, expressed his regrets at his inability to be present, but wished the meeting a success in every particular. Mr. Hogaboom was then introduced as chairman.

COLLOIDS

Among those present were the following as special guests: William Snyder, representing the New York Branch; Robert Isensee, representing Bridgeport Branch; Frank J. Clark, representing the Hartford Branch; Mr. Olsen, superintendent of the manufacturing jewelry plant of Theodore W. Foster & Brother Company, Providence; Mr. Joyce, factory manager of the Ostby & Barton Company plant, Providence; Mr. Waterfield, superintendent of the Watson Company plant, Attleboro; William H. Mason of THE METAL INDUSTRY.

Prof. Strachan was the first speaker and by the aid of several small bottles containing various colored solutions he gave an interesting and instructive demonstration of colloids, which he said might be termed small particles, as upon the size and thickness of the particles depended the color of the solution obtained. He said that colloids were the intermediary between crystals and solutions and that the coloration depended upon the size of the particles. He said that coloration also depended greatly upon whether seen by transmitted or reflected light. Although considerable advance has been made in the

science of colloids, Prof. Strachan pointed out that the study was very complex and complicated and needed much research.

CLEANERS

Mr. Munning gave a very comprehensive and exhaustive address concerning problems of metal cleaning. He said that the great difficulty in attempting to discuss this topic is met at the very outset in that there is no established standard as to what "clean" means, and certainly there is nothing that so governs the success of chemical work as cleanliness. In electro-plating there are three outstanding features: preparation of work, actual deposits and finishing. In the preparation of the work there are three processes, mechanical, chemical and electro-chemical.

Mr. Munning then proceeded to explain in detail each of the three classes then told at considerable length the results of experiments that he had made in investigating some 38 or 40 of the leading commercial cleaners, the majority of which he said contained caustic soda. Metal cleaners, he said, to be fully successful should be applicable to forms of iron, steel, brass, bronze, aluminum zinc, tin plate, silver plate, nickel plate and some others. Such a cleaner should be economical so as to use little; efficient, to work quickly; effective, to precipitate dirt and remove grease; not harmful either to the user or the article; inexpensive, to eliminate cost, and shippable, to be conveniently handled and shipped.

RESEARCH ON NICKEL PLATING

Mr. Hogaboom had no prepared address and gave a talk concerning experimental research work in connection with nickel plating, showing diagrams and figures in illustration of his presentation.

The educational session continued until nearly 6:30 P. M. following which there was a brief informal get-together in the parlors adjoining the ball room where the banquet was held. In the meanwhile the committee of arrangements consisting of Gavin J. Tyndall, George J. Weigand, Ernest Alsfield, Frank Grant, Robert Crook and John E. Garrick had been busily engaged in decorating the banquet hall. Long festoons of balloons of every conceivable shape, size and hue were suspended above the small group tables, and across these were thrown hundreds of multi-colored streamers, the whole forming an airy and attractive canopy beneath which the diners enjoyed an excellent beefsteak dinner in seven courses, while vocal and instrumental musical program was given.

Following the dinner, Honorary President Albert W. Clafin, of George L. Clafin & Company, delivered a well-chosen address of welcome following which greetings were extended by the representatives of visiting branches. At 9 o'clock the floor was cleared and dancing was the order until midnight. The affair was one of the pleasantest ever held.—W. H. M.

ST. LOUIS BRANCH

HEADQUARTERS, CARE OF H. H. WILLIAMS, 4156 BOTANICAL
AVENUE. GRAND 1475-W.

In celebrating their twelfth anniversary on Saturday, January 31, 1925, St. Louis Branch was fortunate to have Dr. H. L. Ward, of Washington University, conduct the educational session in the afternoon. He enlightened those present regarding the mysterious actions that take place during electro deposition, and his talk was worth while to everyone.

This lecture was the main feature of the educational session that was arranged for 3:30 p. m. sharp. This subject and others were open for questions and discussions.

The educational session was followed by usual banquet, entertainment and dance, beginning at 6:30 p. m. sharp. The ladies were entertained during the afternoon meeting.

AMERICAN CHEMICAL SOCIETY**DIVISION OF INDUSTRIAL AND ENGINEERING CHEMISTRY**

HEADQUARTERS, CARE OF ERLE M. BILLINGS, EASTMAN KODAK COMPANY, RESEARCH LABORATORY, ROCHESTER, N. Y.

The Division of Industrial and Engineering Chemistry of the American Chemical Society requires completed papers to be submitted on or before March 1, 1925, for review. If a favorable report is obtained from the reviewers then the paper is placed upon the final program of the Division, to be held in Baltimore, Md., April 6-11, 1925.

A day and a half symposium has been planned on Corrosion. In addition to papers by these well-known students of corrosion there are several interesting ones by men who have given intensive study to particular problems. The theoretical considerations which will be covered include a full discussion of the present state of the theory as it has been worked out by the collaboration of

representative Americans; also, the applications and advances along special lines which have recently been made in Europe. The newer electrolytic theory of corrosion, which has been developed during the last few years, will be thoroughly discussed. The subject matter will include such general fields as the corrosion of brasses; corrosion of iron; corrosion of aluminum alloys; corrosion of stainless steels; the effect of minute films on corrosion;

corrosion of alloys at high temperatures, and antique bronzes.

The program contains such names as Dr. W. R. Whitney, the original exponent of the electrochemical theory; Dr. W. D. Bancroft, our chief authority on the physical chemistry of corrosion; W. H. Bassett, perhaps the chief authority on corrosion resisting alloys; Dr. Guy D. Bengough and Dr. Ulick R. Evans, the foremost authorities of England.

Personals

ZAY JEFFRIES

Zay Jeffries, a member of the Executive Committee of the Institute of Metals Division, A. I. M. E., was born in Willow Lake, S. D., April 22, 1888. His parents were Johnston Jeffries and Florence (Sutton) Jeffries. He was educated in Pierre, S. D., graduating from the high school in 1906, and received the degree of B. S. in Mining Engineering in 1910, and Metallurgical Engineer in 1914, both from the South Dakota School of Mines. In 1918 he received the degree of Doctor of Science from Harvard University. In 1911 Dr. Jeffries married Frances Schrader in Rapid City, S. D. They have two daughters, Betty and Marion.



ZAY JEFFRIES

Dr. Jeffries' professional career has been, briefly, as follows: manager Ideal Mining Company, Custer, S. D., 1910-1911; instructor in metallurgy, Case School of Applied Science, Cleveland, Ohio, 1911-1916; assistant professor of metallurgy, Case School, 1916-1917. While at the Case School he carried on consulting and experimental work in metallography for the Electric Railway Improvement Company, Cleveland Steel Tool Company, W. S. Tyler Company, Lincoln Electric Company, the Aluminum Castings Company and General Electric Company (Cleveland wire division). At the present time Dr. Jeffries is the head of the Cleveland Section of the Research Bureau of the Aluminum Company of America, acting as Consulting Metallurgist for that company; Consultant on Research and Development for the National Lamp Works of the General Electric; and Consultant on Research and Metallurgy for the National Tube Company. Among Dr. Jeffries publications are the following: "The Effect of Temperature, Deformation and Grain Size on the Mechanical Properties of Metals," Institute of Metals Division, 1919; "Metallography of Tungsten," Institute of Metals Division, 1918; "Grain Grown In Metals," British Institute of Metals, 1918; "Grain Size Measurements," Chemical and Metallurgical Engineering, 1918; "The Amorphous Metal Hypothesis and Equi-cohesive Temperatures,"

American Institute of Metals, 1917. With R. S. Archer Dr. Jeffries is the co-author of the book, *The Science of Metals*, which has been reviewed in a previous issue of *THE METAL INDUSTRY*. He is a member of the following societies: Institute of Metals Division A. I. M. E., Franklin Institute, Faraday Society, British Institute of Metals, Cleveland Engineering Society, American Society for Testing Materials, American Society of Steel Treathers, Society of Automotive Engineers, fellow American Physical Society.

R. D. Foster, vice-president of the Hanson & Van Winkle Company, Newark, N. J., resigned February 1, 1925, after thirty-three years of service.

Robert M. Catlin, Eastern Manager of Mines of The New Jersey Zinc Company, of New York, was elected president of the Mining and Metallurgical Society of America, at their recent meeting in New York.

O. L. Chapman has joined the sales organization of the Scott Valve Manufacturing Company, of Detroit. Mr. Chapman will devote his time to the application of valves to manufacturing plants and similar lines of industry.

Reginald Wehrkamp Richter, is now connected with the American Smelting & Refining Company, Perth Amboy, N. J., in the smelter department, as chemist. He was formerly with the U. S. Metals Refining Company in Carteret, N. J.

George Dubernell, who graduated from the University of Michigan in June, 1924, and recently completed researches on nickel plating, rolled sheet zinc for the Apollo Metal Works, La Salle, Ill., is now employed as a research chemist by the Manhattan Electrical Supply Company, Jersey City, N. J.

Charles A. Woodruff, for years associated in the purchasing end of the automobile and other fields, has joined the George W. Dunham Corporation, of Utica, N. Y., manufacturers of electrical labor saving appliances. Woodruff was formerly purchasing agent of Armour & Company, Chicago; the National Cash Register Company, of Dayton; the Chalmers Motor Company, of Detroit, and the Earl Motor Company, of Jackson, Michigan. His present connection is that of purchasing agent with the Dunham Corporation.

Dr. Carl Benedicks, Director Metallographic Institute of Stockholm, Sweden, who will deliver the annual lecture before the Institute of Metals Division in February, 1925, received the Carnegie scholarship and gold medal of the Iron and Steel Institute of London in 1908. In 1922 he received the Prix Henry Wild, Academie des Sciences in Paris.

Dr. Benedicks is a member of the Royal Academy of Scientific Industrial Research in Stockholm; honorary vice-president, Iron and Steel Institute, London; member, Royal Society of Upsala, and the Royal Academy of Sciences, Stockholm, 1924. He has written about 200 papers on mathematics, physics, physical chemistry, inorganic chemistry, mineralogy, and especially metallography.

Obituaries

EDWARD E. SQUIER

Edward E. Squier died in St. Louis on December 15th. He was president and founder of the Edward E. Squier Company, distributor of foundry molding sand, St. Louis, Mo., and a pioneer Mississippi River steamboat pilot. Mr. Squier was born in Morristown, N. J., in 1842.

THEODORE CRAMP

Theodore Cramp, youngest son of the late William Cramp and the last male survivor of the Cramp family of shipbuilders,

died recently at the Union League Club, Philadelphia, Pa. He was 86 years old. Mr. Cramp was formerly a member of the Williams Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa.

CHARLES EDSON ROBINSON

New York business publications will regret to hear of the death of Charles Edson Robinson, who died in Newport, R.I., January 10, 1925. Years ago Mr. Robinson was connected with various trade journals, as they were known then, in different capacities. He always took a great interest in them,

reading the publications and commenting on them up to a few months before his death. For a number of years he was with the business department of THE METAL INDUSTRY. He had the sterling traits of character which abound with the inhabitants of the New Hampshire Hills, and was a notable figure and personality. He had lived almost eighty-nine years, having been born in East Concord, N. H., July 23, 1836. Since January, 1915, he had resided with his son, Dr. Edwin P. Robinson of Newport, R. I.

LIONEL D. WAIXEL

The untimely death of Lionel D. Waixel, general manager of the Union Smelting & Refining Branch of the Federated Metals Corporation, came as a great shock to a host of friends and business associates. Possessed of rare acumen and business ability and being a man of fine personality, Mr. Waixel leaves an impression among his friends, and also in the metal world, which will long be remembered.

He was born in the city of New York, 43 years ago and lived there all his life. After attending the public schools of that city, he continued his education at the College of the City of New York. In 1902, with Samuel Turkus, he entered into a partnership known as the Union Smelting & Refining Company. As a result of their knowledge of the metal business and the reputation which the firm gained for honorable dealing, the business grew steadily until in 1914 it was consolidated with the White Metal Branch of the Eagle Smelting & Refining Works of New York and the new organization called itself Union Smelting & Refining Company, Inc., electing Mr. Waixel president of the company. Last year the Federated



LIONEL D. WAIXEL.

Metals Corporation was formed including this company. Mr. Waixel was made a member of the Board of Directors and general manager of the Union Branch.

As president of the old company and general manager since the consolidation, Mr. Waixel's work brought him in contact with a great many people in the metal industry and the admiration and respect with which he was held by all who knew him was a striking tribute to the fine character of the man.

Mr. Waixel was unmarried and lived at 33 E. 63rd street, New York City, N. Y. He is survived by three sisters.

WILLIAM D. HOXIE

William D. Hoxie, vice-chairman of the Babcock & Wilcox Company, died on January 12th on the Munson liner "Southern Cross," on which he had sailed on January 3rd with his wife and niece for a trip to South America.

Mr. Hoxie had been for many years an outstanding figure in the manufacturing of boiler equipment for industrial plants and marine work. It was due largely to his genius and enterprise that the Babcock & Wilcox Company became such a prominent factor in the building of industrial and marine boilers. Their marine boiler as it exists today is due to the invention and constant improvements by Mr. Hoxie.

He was born July 1, 1866, in Brooklyn, N. Y., and received his preliminary education in the public schools there. Having marked mechanical aptitude he took the course at Stevens Institute of Technology and graduated as a mechanical engineer in 1889. In that year he became connected with the Babcock & Wilcox Company and his whole active life thereafter was spent in its service where there was every opportunity for his remarkable talent as an engineer.

In 1892 he married Miss Lavinia Brown of Westerly, R. I., who was with him at the time of his death. They have one daughter, Mrs. Cornelius W. Middleton.

Mr. Hoxie was a man of remarkable geniality and personal charm and had a very wide circle of friends. He was also an enthusiastic yachtsman. He was a trustee of Stevens Institute of Technology and also of Webb Institute of Naval Architecture and of the Wilcox Memorial Library of Westerly, R. I. He was a member of the Engineers, New York Yacht and Lawyers Clubs of New York and of the Army and Navy Club of Washington, D. C., and of the Delta Tau Delta Fraternity.

He was also a member of the American Society of Mechanical Engineers, the American Society of Naval Engineers and the Society of Naval Architects and Marine Engineers.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

FEBRUARY 2, 1925

Manufacturers of the Brass City are joining forces for a spirited fight before the Interstate Commerce Commission on the proposed increase in freight rates which will seriously penalize this section according to local traffic men.

As the result of an order of the commission for a general investigation of all class rates in and out of New England to territory west of the Hudson, the railroads have submitted to the shippers, rates which, it is claimed here, will put Waterbury at a disadvantage. The proposed increase in transportation costs in and out of Waterbury will be from 13 to 22 per cent. If it goes into effect it will cost Waterbury from three-quarters of a million to a million dollars more annually than at present for freight. Waterbury manufacturers and a number of the leading merchants are joining with the traffic committee of the Chamber of Commerce to raise a fund of three or four thousand dollars to employ counsel to appear before this month's hearing of the commission.

More than 400 members of the Scovill Foremen's Association attended the 13th annual banquet of the organization, last month at The Elton. E. O. Goss, president of the company, and John H. Goss, vice-president and general superintendent, were the principal speakers. Mayor F. P. Guilfoile welcomed the men and Sherman Rogers, the lumberjack

orator, made an address. President Goss told of his experiences in hunting game in the north woods and John Goss talked on shop problems.

William J. Larkin, superintendent and vice-president of the Waterbury Clock Company, retired last month, after 43 years of service. A dinner was given him the day he formally retired, and Irving H. Chase, president of the company, on behalf of the officers and foremen of the company, presented him with a Masonic ring.

Alvin E. Gillett, formerly an employee of the Chase Companies, Inc., resigned last month, as secretary of the local Chamber of Commerce, a position he has held the past three years, to take the position of secretary of the City Club of New York City.

Former stockholders of the American Brass Company, now stockholders of the Anaconda Copper Mining Company, were notified last month that the manufacture and sales of brass pipe by the American Brass Company last year, showed an increase of 1,000 per cent over the manufacture and sales three years ago, before the consolidation with Anaconda.

The Scovill Manufacturing Company has submitted a bill to the legislature to amend its charter to allow an increase in its capital stock to any amount not exceeding the value of its assets, to allow dividing the present shares of stock or making them of no par value and to increase its board of directors.—W. R. B.

BRIDGEPORT, CONN.

FEBRUARY 2, 1925

Hearing of evidence in the suit of the Bridgeport Brass Company against Tax Collector Edward A. Drew, growing out of the latter's attempt to collect back taxes on a \$120,000 certificate of error, issued in 1921, have been completed. Judge Carl Banks of the Superior Court will make a finding of fact, and the case, brought to test the legality of the issuance of the error certificates, will go to the Supreme Court on reservation. It is the contention of Drew that the issuance of the certificate of error was illegal, while the Brass Company maintains that it was legal. Drew brought suit against the company after he had been advised that he was liable for back taxes. He also threatened to attach assets of the company and the latter obtained an injunction against him to prevent his doing so and then brought suit against him to test the legality of the statutes.

The McNab Corporation, capitalized at \$1,000,000, has been organized here by Commander Alexander McNab of this city and his associates. They intend to establish a large plant in Bridgeport for the manufacture of marine implements protected by the McNab patents. Subsidiaries of the concern will be the McNab Company and the McNab Kitchen Rudder Corporation, both of this city. Officers named in the incorporation papers are: Hamlin F. Andrus, of Yonkers, chairman of the board; A. McNab, president; Stewart M. Seymour, of New York, vice-president. These three and Thomas C. P. Martin, of New York, constitute the board of directors.

Simon Lake, submarine builder and inventor, answered the move started by Senator William King, of Utah, to probe the construction of submarines by the Lake Company, of this city, and of the Submarine Boat Company, of New London, by declaring he would be only too pleased to appear before a Senate investigating committee, and "tell the whole world about the rotten deal the Lake Torpedo Company got from the government." The navy has not and never had any boats that will meet the test and surpass in performance the boats built right here in Bridgeport, he declared. He sent his to the navy yard and showed the Navy Department how to build its boats, allowing it the use of his plans, and the deal he got in return is "almost unbelievable," he declared.—W. R. B.

TORRINGTON, CONN.

FEBRUARY 2, 1925.

All plants here are running on full time. Orders continue to come in satisfactorily though the tendency remains for smaller and more frequent orders. The general belief is that the old pre-war plan of ordering in maximum quantities has been permanently abandoned.

For the purpose of eliminating delays in shipping orders of less than carload lots, the manufacturers here are co-operating under a system whereby individual orders are collected and sent out in carloads as express freight to transfer points at Maybrook, West Albany, Port Morris, Waverly, Manchester, Elizabethport, Newport, Boston, Chicago or Cleveland and there split up and forwarded to their respective destinations. Until this arrangement was perfected, all shipments in less than carload lots were sent to Waterbury, there to be transferred. The new system not only expedites the movement of the freight but insures its arrival in better condition, owing to the fact that one or more additional handlings are eliminated. As the need arises, new transfer points will be added to those already listed. The details of this system, which has proved highly effective in operation, were worked out by E. W. Plumb, superintendent of the Torrington freight station, and George H. Atkins, secretary of the Employers' Association.

Labor conditions here are steadily improving, additional workers being taken on gradually at all the plants. The downward trend in wages noted recently in the woolen and cotton industries of New England has not been reflected in the metal industry.

The principal metal industries of Torrington are assessed for the following amounts on the new city grand list just completed by the assessors: American Brass Company, \$3,891,450; Standard plant of Torrington Company, \$1,041,375; Union

Hardware Company, \$974,950; Excelsior plant of Torrington Company, \$862,991; Hendey Machine Company, \$985,302; Progressive Manufacturing Company, \$257,768; Fitzgerald Manufacturing Company, \$131,390; Torrington Manufacturing Company, \$302,597; Turner & Seymour Manufacturing Company, \$368,314. Practically all of them show an increase over the assessments for last year.

Among the largest estates probated in Torrington during 1924, according to figures on record at the office of the judge of probate, were those of John F. Alvord, late president of the Torrington Company, \$3,957,813.44, and Luther G. Turner, for many years president of the Turner & Seymour Manufacturing Company, \$225,885.50.—J. H. T.

NEW BRITAIN, CONN.

FEBRUARY 2, 1925

The New Year has got away to a good start at all of the local factories, every one of which reports conditions good and the outlook for the spring trade promising. Reflecting the recent good business and an optimistic outlook, is the action of the directors of the Stanley Works on January 17, 1925, when it was voted to retire 25 per cent of the preferred stock on March 1, 1925, thus reducing the preferred to four millions. It also was recommended to the stockholders that the common stock be increased from six and a half million dollars to ten million four hundred thousand dollars. If this is accepted at the annual meeting it will effect an increase from 260,000 shares at \$25 par to 416,000 shares. Such an increase would be made by authorizing and issuing common stock in the amount of \$3,900,000 comprising 156,000 shares, as a stock dividend to holders of record on February 14, 1925.

The P. and F. Corbin Branch of the American Hardware Corporation is handling a goodly amount of trade, there being a brisk demand for hardware equipment in the wholesale and retail market. This also boosts the business at the Russell and Erwin Plant, the Corbin Screw Corporation and the Corbin Cabinet Lock Company, all branches of the American Hardware Corporation.

The Traut and Hine Company continues to maintain a good working average, following the shake-up and organization at the factory several months ago, and at the North & Judd Manufacturing Company, where another change in personnel has lately been effected, business is reported as favorable.

At Landers, Frary & Clark, Col. Herbert Johnson, who for several years had been manufacturing superintendent and vice-president has resigned. It is authoritatively rumored that he is to return to the North & Judd plant, where he was at one time general superintendent. The Landers' concern is working at capacity in most departments and the market is absorbing its electrical equipment goods with alacrity. The cutlery and other branches are about as usual.—H. R. J.

PROVIDENCE, R. I.

FEBRUARY 2, 1925

That 1925 will be a prosperous year and that Rhode Island industry is in a position to share in any general prosperity is the consensus of opinion of the leaders in local financial and industrial circles. Statements are almost uniformly optimistic and show that, aside from hopefulness based upon fundamental economic conditions here and abroad, there is an inclination to look for better things ahead because of the results of the recent elections.

Henry D. Sharpe, treasurer of the Brown & Sharpe Manufacturing Company, says speaking of general business and the outlook for New England: "The year 1925 promises, we believe, a gradually increasing business, not only for the country at large but for Rhode Island, in particular. Substantial crops are an obvious omen of stronger business, and the steady betterment of political conditions in Europe is the best thing that could happen."

A similar view is expressed by Samuel M. Nicholson, president of the Nicholson File Company, in the following words: "A spirit of confidence in the future has been generally manifested since the national election, and all the business indicators point to a rather broad expansion of production and dis-

tribution, for the first part of 1925 at least. Rhode Island, being in the midst of the nation's workshop, should share the general activity in good measure."

A decrease of 16,790 in the number of persons employed in the various establishments in Rhode Island is shown in the annual report of the chief factory inspector, J. Ellery Hudson, presented to the General Assembly a few days ago. The per-

centage of child labor was 2.2 per cent during the year 1924 as compared with 2.62 for the preceding year.

William B. Cheever, for several years foreman for the Payton & Kelley Company, Inc., manufacturing jewelers, has resigned to enter business for himself. He is succeeded by Harold Swanton, formerly with E. A. Potter & Company.—W. H. M.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

FEBRUARY 2, 1925

In many ways the new year has not developed such an optimistic sentiment as was anticipated at the close of 1924. Although better business conditions prevailed during December, the increase in activity did not continue long after January 1, 1925. In fact, in almost every manufacturing plant using metals throughout the city there appeared to be a slowing down.

In conversation with various persons in the local industrial field it was said that January is generally a quiet period in manufacturing lines, so far as Rochester is concerned, and that annual inventories and plans for the carrying out of inventory results had a slackening effect. This, it was said, would not continue long, and it is expected that soon after February, industrial activities would begin to show a pronounced increase.

Inquiry among the brass and aluminum industries indicated that a period of dullness had prevailed for about three weeks, while in December every brass worker in Rochester was employed. No new enterprises are planned at the present.—G. B. E.

TRENTON, N. J.

FEBRUARY 2, 1925

The various metal plants in Trenton continue busy and are looking for a good spring. The increase in the pottery output at the big pottery centre here greatly aids the metal industry. There is also a good demand for winter hardware and jobbers report good orders on builders' hardware for delivery shortly. The Trenton Emblem Company reports that it is operating to capacity. The J. L. Mott Company, now in the hands of receivers, is again experiencing old time prosperity and each department is busy.

Lectures on metals and alloys are being delivered in the chemical lecture course at the Trenton School of Industrial Arts. These subjects include, copper, zinc, tungsten, brass, bronze, type metal, Monel metal, fusible links, etc.

Federal Judge Runyon has appointed Louis Schnelder receiver for the Empire Miniature Lamp Corporation manufacturers of incandescent lamps, of 309 Main street, Orange, N. J. Creditors filed an involuntary petition in bankruptcy against the corporation. Liabilities are said to be in excess of \$18,000 and assets at \$5,000.

Fire of unknown origin recently destroyed the Schutte-Koerting Manufacturing Company, at Cornwells, Pa., near here, causing a loss of about \$65,000. The company manufactured sea valves, oil strainers and condensers used on submarines and war vessels and employed 250 hands. The employees aided the firemen in fighting the flames. The plant will be rebuilt.

The following concerns were incorporated here during the month: Standard Jewelry Manufacturing Company, Newark, N. J., to manufacture jewelry, \$100,000 capital; Jade Jewelry Manufacturing Corporation, Newark, N. J., to manufacture jewelry, \$50,000 capital; Maywood Hardware Company, Inc., Maywood, N. J., hardware, \$25,000 capital; Metal Edge Filter Corporation, Montclair, N. J., manufacture filtering devices, 1,500 shares no par value; Alfred P. Hummers, Inc., Bogota, N. J., electrical batteries, \$10,000 capital; Rice Hardware Company, Hammonton, N. J., hardware, \$125,000 capital; Newark Lighting Wares, Inc., Newark, N. J., radio supplies, \$25,000 capital; Ureco Manufacturing Corporation, Newark, N. J.,

radio supplies, \$250,000 capital and 10,000 shares no par; Horni Signal Manufacturing Corporation, Newark, N. J., electrical supplies, \$500,000 preferred and 10,000 shares no par; Electra Radio Molding Corporation, Newark, N. J., radio supplies, 300 shares no par; Monarch Electrical Supply Company, Newark, N. J., electrical supplies, \$100,000 capital; Brass and Copper Tube Works, Inc., Newark, N. J., \$100,000 preferred and 4,000 shares no par; Strode Battery Service, Camden, N. J., batteries, 1,000 shares no par; Cole Radio Manufacturing Corporation, radio supplies, Newark, N. J., 5,000 shares no par; Cuny & Guerber Inc., Hoboken, N. J., electrical appliances, \$125,000; New Jersey Smelting and Refining Company, Jersey City, N. J., metal refining, \$50,000 capital; Taub Plumbing Supply Company, Inc., Newark, N. J., plumbers' supplies; \$100,000 capital; The Audition Corporation, Hoboken, N. J., hardware, \$45,000 preferred and 5,000 shares no par.—C. A. L.

BALTIMORE, MD.

FEBRUARY 2, 1925.

The optimistic outlook at the beginning of the new year has been justified by trade conditions throughout January, and although business is still being done on a very narrow margin of profit, it is confidently expected that a rise in prices will follow the pronounced speeding up of mill activities.

A new industry was launched in Baltimore, January 22, 1925, by the incorporation of a company which will manufacture automobile radiators and cores. The new company is called the Motor Radiator Corporation, and is capitalized at \$100,000, \$20,000 common stock, and \$80,000 preferred. The officers are: Springfield Baldwin, president; George A. Dornin, vice-president; Harry M. Cummins, secretary and treasurer. These officers, with one other, comprise the board of directors. Another director is to be elected at the next meeting. This corporation proposes to build a plant in the near future, and will manufacture two special tubular radiators of a new model.

The annual meeting of the Baltimore Brass Company was held at the offices of the company on January 20th, when officers were elected for the coming year. John W. Pilling was re-elected president and treasurer, T. E. Gilbert, vice-president and general manager, and George S. Doherty, secretary. The board of directors is composed of John W. Pilling, Carlton N. Aborn and George S. Doherty.

William H. Pierce, president of the Baltimore Copper Smelting and Rolling Company, sailed for Europe the latter part of January for a trip of several months, during which time he will visit the various branches and agencies of his company in England and on the continent.—H. L. B.

PITTSBURGH, PA.

FEBRUARY 2, 1925

Operations in all lines of the metal industry throughout Pennsylvania continue to show improvement. Mills have reached the highest percentage of production since last March. The plants now are running at approximately 90 per cent capacity.

The Gould Coupler Company and Gould Storage Battery Company, a New York concern, has been purchased by Charles J. Graham, of Pittsburgh. Mr. Graham is vice-president of the Graham Bolt and Nut Company, of Pittsburgh, and president of the American Railway Appliances Company, of New York.—H. W. R.

DETROIT, MICH.

FEBRUARY 2, 1925

The Burns Brass Foundry Company, at Battle Creek, has recently been reorganized with Fred Flanders, of Coldwater, and Charles Follett, of Battle Creek, as new partners of Lorin H. Skinner. The organization it is said, plans to specialize in brass, aluminum and bronze castings, custom work for garages and bushings.

It is announced that the Des Laurier Metal Products Company will break ground in the near future for a new factory at Central and Bonaparte avenues, bringing the factory and general offices to Detroit from Minneapolis.

The Bennett Injector Company, a new concern at Muskegon Heights, is engaged in the manufacture of oil and grease handling equipment. The sales manager is S. H. Frensdorf.

P. J. Sweeney, superintendent of the Pemberthy Injector plant in Windsor, Ont., across the river from Detroit, holds the Michigan record for ferry boat traveling. For 40 years he has been crossing the Detroit river to his work. Sometimes he has made the trip in eight minutes and in some seasons, when the ice has been thick, the journey has taken three hours. Officers and crews of the ferry boats have come to know Mr. Sweeney and to expect him at exactly the same hour each morning and evening.

Fire recently destroyed the interior of the three-story brick building occupied by Moynahan & Duchene, manufacturers of brass and bronze fittings. The loss is estimated about \$30,000. The origin of the fire has not been definitely determined.

The Best Manufacturing Company, of Cleveland, has purchased 47.5 feet of frontage on the north side of Holden avenue, between Hamilton and Lincoln avenue, Detroit, for a warehouse and distributing point for plumbers' brass specialties and rubber goods. The Detroit branch for five years has been under the management of Clifford Jones. The building to be erected will contain 10,000 square feet of floor space.

The automobile show, came to a close with one of the finest displays of automobile and accessories ever attempted in Detroit. The event proved a decided stimulation to the industry and at the present time the plants are pushing their output more intensively than they were a year ago at this time. Manufacturers of brass and aluminum products already are experiencing a revival in their line as a result of better conditions in the automobile field. The outlook is promising now for a steady run of business for some time.

The Owosso Bronze Bearing Company, of Owosso, Mich., maintained a higher production schedule during the last part of 1924 than for any other corresponding period in its history, it is stated. The major part of the company's output consists of automobile bushings.

The new foundry buildings of the Cadillac Motor Car Company are now nearing completion and already in partial operation. They cover an area of several acres. The buildings include three main units for brass, aluminum and iron, with a sand storage structure 60 by 180 feet, having a capacity of

8,000 tons. The buildings are in a line nearly 600 feet long and separated by courts 28 feet wide. The central position is held by the brass foundry and core room, a building 421 feet long and 122 ft wide.

The Kalamazoo Stove Company, at Kalamazoo, will erect a new warehouse, it is announced.

The Bostick Stove Company, at Lapeer, manufacturers of casting for the automobile industry, is increasing its force. It is stated that orders are coming in better than at any time within the last six months, President A. D. Bostick states. —F. J. H.

CHICAGO, ILL.

FEBRUARY 2, 1925

In general, business among the Chicago metal dealers continues to be excellent, and the outlook for the year is most promising. R. G. Raphael, salesmanager of the Federated Metals Corporation, declared that in spite of the flurries that have featured the metal markets recently, there has not been a noticeable slowing up of business for them.

E. L. Murphy, of E. L. Murphy & Company, expressed the opinion that a larger business would soon develop for the metal men. The first days in January were very good, he stated, but toward the latter part of the month, declines in the markets upset business slightly. However, this condition is believed only temporary and a readjustment is expected which Mr. Murphy believes will return a brisk trading.

Burglars recently worked several hours forcing an entrance to the Central Plating Company, 401 South Clinton street, and then knocked the combination off the safe in the company's office to obtain \$10.

About 235 pigs of lead valued at \$4,000 and belonging to the Sherwin-Williams Company were stolen recently by thieves who broke into a box car standing in the yards of the Kensington, Ill., plant of the company. The robbery was not discovered by workmen until after ten o'clock the next morning.

The board of directors of the Federated Metals Corporation will hold a meeting in New York during the last week of January, it was announced here.

William Powell of the Powell Brass Works, Grand Rapids, Mich., in Chicago for several days during the latter part of January on business.

The secretary of state of Illinois has recently chartered the Imperial Metal Corporation, 3646 South Rockwell street, capitalized at \$10,000. The firm will deal in machinery and metals. The incorporators are Fred I. Simon, Louis L. Becker and Max M. Korshak.

E. V. Roddin & Company, 29 East Madison street, was also recently chartered with a capital of \$10,000 to manufacture and deal in jewelry, precious stones, etc. The incorporators are Harry C. Levinson, Floretta Soltow and C. R. Golder. —L. H. G.

Business Items—Verified

J. Holland & Sons, 489 Broadway, Brooklyn, N. Y., have just received a very large stock of used plating and polishing equipment of all sorts.

S. S. Fretz, Jr., & Company, Philadelphia, Pa., state that, contrary to published reports, they do not contemplate erecting a new building at this time.

The Whipple & Choate Company, Bridgeport, Conn., announces that C. S. Dunbar is no longer connected with the firm. L. C. Wilson is now manager.

M. M. Mayer, who was located at 58 E. 10th street, New York City, is now at 82 E. 10th street. He handles a full line of platers' and polishers' supplies.

Universal Shot and Sand Blast Manufacturing Company, 14th and Grand streets, Hoboken, N. J., has just been organized to build a line of sand blast equipment.

Hilo Varnish Corporation, Brooklyn, N. Y., sent out, January 22, an envelope with a colored glassine paper insert

through which the eclipse could be viewed with safety.

Empire Metal Casting Company has removed from 502 West Broadway to 65-67 West Houston Street, New York City. This concern manufactures cast white metal goods for the trade.

John A. Roebling's Sons Company of Cal., San Francisco, Calif., states that an item, published elsewhere, announcing that it is taking bids at once for a two-story factory branch, is not correct.

The New York Brass Turning Company, 231 Bowery, New York, has leased property at 568-74 Broadway for a new works and headquarters. This firm will specialize in fixture and hardware parts.

The Blodgett Engineering and Tool Company, of Detroit, have added Roy Gill to their sales organization. Mr. Gill will work directly out of the Blodgett factory as a special sales and service representative.

The Scott Valve Manufacturing Company, of Detroit, have appointed Chas. H. Tinker Company, 201 Devonshire Street, Boston, Mass., as New England representatives, for the Scott complete line of bronze and iron body valves.

Rome Wire Company, Rome, N. Y., has acquired the Diamond Wire Company, Clyde avenue, Buffalo, N. Y., and will consolidate the two organizations. It is understood that the Buffalo works will be continued in operation.

The Ely Anode & Supply Company, Inc., New York, has just completed many changes and additions to its plant. The melting capacity has been practically doubled. A. R. Bray is superintendent of the plant in New Haven, Conn.

Shapiro & Aronson, Brooklyn, N. Y., manufacturers and designers of electric lighting fixtures, are equipping their factory with a complete chemical and technical laboratory, for the testing of all materials before going into production.

Baltimore Tube Company, Inc., announces the opening of a New England office in the Boston Chamber of Commerce Building, 80 Federal street, Boston, Mass., and the appointment of Benjamin F. Brusstar as district sales manager.

The Employing Electrotypers and Stereotypers Association of New York City, at a special meeting held January 26, 1925, duly made, seconded and carried a motion that the scale dated January 20, 1925, was issued without the official knowledge or sanction of the association.

The Phoenix Utility Company has awarded to the William Cramp & Sons Ship and Engine Building Company a contract for two 21,500-horsepower vertical I. P. Morris turbines complete with governors and auxiliaries for installation in the Cutler plant of the Utah Power & Light Corporation.

Dallas Brass & Copper Company, 820 Orleans street, Chicago, Ill., has awarded a contract for a one-story brick and steel sash building, 100 x 120 feet, which will be used as a casting shop and rolling mill. The cost of the plant will be approximately \$250,000. This firm operates a casting shop and rolling mill.

N. De Caro and I. Jaffe have opened a plating shop at 88 Walker street, New York City, to be known as the Model Electro-Plating and Polishing Works. They will specialize in plating of coffee urns, and restaurant equipment, also entire hospital equipment of large sizes. This firm operates plating, polishing and soldering departments.

The Scott Valve Manufacturing Company, of Detroit, Michigan, have appointed Russell F. Kleinman, Land Title Building, Philadelphia, Pa., as their sales representative. Mr. Kleinman will handle the complete line of Scott bronze and iron body valves in Eastern Pennsylvania, Southern New Jersey, Maryland, Delaware and the District of Columbia.

More-Jones Brass & Metal Company, St. Louis, Mo., is erecting an entirely new foundry, machine shop, and white metal department with office in connection, which will be located in the central western part of the above city. This firm operates the following departments: brass, bronze and aluminum foundry; brass machine shop, tool room, grinding room, casting shop.

In the School of Science and Technology of Pratt Institute, Brooklyn, N. Y., Thursday evening, March 5, from 7:30 to 9:30 o'clock, will be "Visitors' Night." The extensive laboratories, shops and drawing rooms of the school will be open to the public, affording an opportunity to all persons interested to observe the many improvements. There will be no other public exhibition this year.

The DeVilbiss Manufacturing Company, Toledo, Ohio, has opened a down-town office and display room in Chicago. This new location is at 1006 Republic Building, corner of State and Adams streets. There is featured in these new quarters a well arranged display showing of DeVilbiss spray-painting equipment, as well as a large stock of spray guns and other parts making up this equipment.

The New Jersey Brass Foundry, 346 Washington Street, Newark, N. J., under new management, will manufacture brass composition, nickel and aluminum castings. It is renting a foundry for the present and probably will have some of the work done by contract. New equipment will be required in the near future. J. C. Dowling is manager. This firm operates the following departments: brass, bronze and aluminum foundry.

The Hilo Varnish Corporation, Brooklyn, N. Y., held its

annual meeting of the stockholders and the organization meeting of the Board of Directors. The old officers were re-elected and in addition, H. Uehlinger, assistant treasurer, was elected a vice-president in recognition of his thirty years of continuous service with the company. To the president, John H. Schumann, in recognition of over thirty-five years of service, was voted a three months' leave of absence with the suggestion that he take an extended trip abroad.

The Aluminum Cooking Utensil Company has erected a two-story concrete building on the block bounded by Forty-fifth, Forty-sixth, Linden and Adeline Streets, Oakland, Calif. The company has closed its Portland plant and will hereafter make Oakland its distribution center for the Pacific Coast. The company also has transferred its Pacific Coast sales office from San Francisco to the local plant. Seventy-five per cent of the employees of the Portland plant elected to remain with the company and have moved to the East Bay.

Standard-Peninsular Brass Works, W. Warren and Walton avenues, Detroit, Mich., announces the merger of the Standard Brass Works and Peninsular Brass Works, for the purpose of manufacturing cocks, valves and fittings for ranges, hot plates, water heaters, etc., cocks, valves and brass parts for automobiles, cocks, faucets, spigots for water coolers, percolators, etc., and similar sundry brass parts. F. G. Austin, chairman; H. R. Brownell, president; P. E. Welton, vice-president; C. L. Parsons, secretary and treasurer.

The Boston Platers Supply Company, Inc., was succeeded by the Boston Plating Supply Company, Inc., on December 1, 1924, continuing the business at 202 Friend street, Boston, Mass. M. E. Baker, who conducted the affairs of the old company will have as his associate B. F. Lee, formerly with the New England branch of the Hanson & Van Winkle Company. The company distributes the Anderson Chemical Company's lacquers and enamels, and carries at all times a complete and varied line, in addition to a line of polishing and plating supplies and equipment.

The Oneida Community, Ltd., with factories at Sherrill, Oneida and Niagara Falls, N. Y., and Ontario, Can., will hereafter confine its manufacture entirely to silverware, as the result of its sale of the game-trap business, both at Sherrill and in Niagara Falls, Can., to the Animal Trap Company of America at Lititz, Pa. The change is made so that the Oneida Community, Ltd., can expand its fast growing silverware output. According to P. B. Noyes, president, the company has outgrown the trap industry and more room is needed for the silverware.

Blake & Johnson Company, Waterbury, Conn., manufacturers of cold rolling and finishing machinery for strip metal have been appointed exclusive sales agents for the Hallden patented full automatic straightening-and-cutting off machines which has heretofore been sold directly by the Hallden Machine Company, Waterbury, Conn. K. W. Hallden, the inventor of the machine, will, however, continue his relations with the trade by a close working arrangement with the Blake & Johnson Company, and will be available in a consulting capacity as an expert on straightening problems as previously. The Hallden automatic has now been standardized in 20 sizes, most of which are in wide use.

The Detroit Die Casting Company, 442 Jefferson avenue East, Detroit, Mich., plans to manufacture die castings of various metals, small stampings, dies, tools, jigs, etc., having purchased the department of the Detroit Forging Company which was devoted to this line. Its factory at 274 Iron street, a large modern building, is in full operation. The officers of the company are the same as those of Davis, Kraus & Miller, Inc., 440 Jefferson avenue, Detroit, manufacturer of automobile trimmings, of which C. H. Davis is president, L. R. Kraus, vice-president, and Hugh Miller, secretary. E. M. Tallbert is general factory manager. All purchases for the Die Casting Company will be made by Davis, Kraus & Miller, Inc. This firm operates the following departments: brass machine shop, tool room, grinding room, plating, japanning, soldering.

INCORPORATIONS

Midwest Stove & Range Company, 2628 W. Main street, Belleville, Ill., has been incorporated for \$35,000 to manufacture and deal in stoves, ranges, furnaces and parts thereof, by

T. A. Stoelzle, F. Stoelzle and E. E. Frees, and to manufacture newly-designed all-cast coal and combination ranges in full enamel and enamel or nickel trimmings. This firm will operate the following departments: grinding room, plating, jaspining, soldering, polishing.

White Iron Castings Corporation, St. Louis, Mo., has been organized with \$9,000 capital, to manufacture wholesale and retail castings of iron, brass and other metals, by F. W. Feuerbacher, A. H. Feuerbacher, J. P. Doerr and M. W. Feuerbacher, Liberty Central Trust Company, building attorney. The company will operate the following departments: grinding room, casting shop.

Horn Signal Manufacturing Corporation, 153 Frelinghuysen avenue, Newark, N. J., recently incorporated to acquire and develop a business in the manufacture of traffic signals made of steel, aluminum and brass, is in the market for several types of machines. **Charles Millbaur** is president. Engineers are now laying out the shop plan which is to be completed shortly. This firm will operate the following departments: brass, bronze, and aluminum foundry; tool room, grinding room, soldering, lacquering.

BELL TELEPHONE LABORATORIES

The Bell Telephone Laboratories, Incorporated, were organized on January 1, 1925, for the purpose of carrying on development and research activities in the communication and allied fields. This new company, which is jointly owned by the American Telephone and Telegraph Company and the Western Electric Company, Incorporated, has taken over the personnel, buildings and equipment of the research laboratories of these two companies which were formerly operated as the Engineering Department of the Western Electric Company. Extensions of laboratory facilities for the scientists and engineers of the new corporation are already under way. Laboratory space in the form of a new building covering almost a quarter of a city block will be added to the 400,000 square feet at present in service in the group of buildings at 463 West street, New York City. At the date of incorporation, the personnel numbered approximately 3,600.

The operations of the Bell Telephone Laboratories, Incorporated, are under the direction of E. B. Craft, executive vice-president, who was formerly chief engineer of the Western Electric Company. In the functional division of the research, development and engineering work of the laboratories, physical and chemical research is organized under Dr. H. D. Arnold, director of research; development of apparatus under J. J. Lyng, apparatus development engineer, and development of communication systems under A. F. Dixon, systems development engineer, all formerly concerned with similar activities in the Engineering Department of the Western Electric Company. Dr. R. L. Jones, inspection manager, continues his former responsibilities in engineering inspection, and S. P. Grace, commercial development engineer, those of commercial development.

ONEIDA BUYS VAN BERGH

The Oneida Community, Inc., of Oneida, N. Y., will take over, on March 1, 1925, the Van Bergh Silver Plate Company, whose factory and offices, established thirty-two years ago, are at No. 224 Main street west, Rochester, N. Y.

The Van Bergh company has been manufacturing silver-plated hollowware continuously since 1892, when it was founded by Frederick W. and Morris E. Van Bergh, brothers. Later a third brother, Marcus H. Van Bergh, returned from Australia to join the firm. About eight years ago Morris E. and Marcus H. Van Bergh retired from the business, their interests being taken over by the other brother and his son, Maurice.

Frederick W. Van Bergh, president and treasurer of the firm, announced yesterday that he plans to retire permanently from the work of manufacture when the Oneida Community takes over the business. His son, Maurice, will take over the management of the plant in Rochester for the Oneida interests, and will operate the business for a time at least.

MAAS & WALDSTEIN CHANGES

H. C. Flanigan, sales manager for Maas & Waldstein Company, paid their Chicago office a visit right after the first of the year. Found everything going along very nicely out there and was advised by R. J. Hazucha, Chicago manager, that arrangements had been made with J. C. Miller Company, Grand Rapids, Mich., to handle their lacquer business with the metal trade in Michigan. Jack Geissman, of Milwaukee, Wis., will handle the Maas & Waldstein Company line in and around Milwaukee.

Chas. E. Stiers, formerly with the J. B. Ford Company, started in his new position the first of the year as assistant to H. C. Flanigan, sales manager. Chas F. Schriegel is covering the territory from New York to Cleveland, Ohio, working along the New York Central line cities.

A. C. Plant, well known in the lacquer trade from Portland, Maine, to Providence, R. I., is making his first trip for Maas & Waldstein Company and reports business in that section very good.

MAGNUS COMPANY CONFERENCE

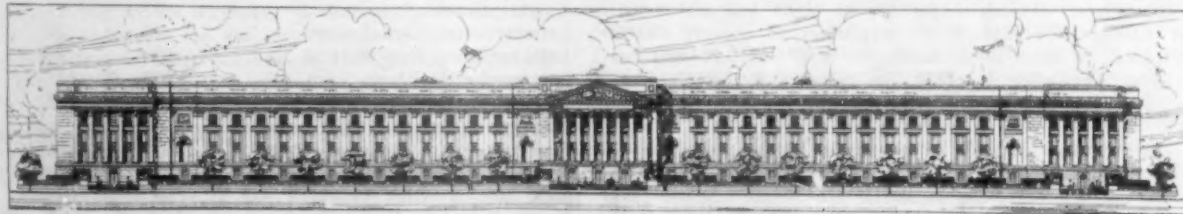
On January 16 and 17, 1925, the Magnus Chemical Company held its semi-annual conference at 718 Atlantic avenue, Brooklyn, N. Y. Eight papers were read and followed by exhaustive discussions. Some of the subjects covered were: "Metal Cleaning," by Walter A. Graue; "New Materials," by Prof. R. W. Mitchell, of the Massachusetts Institute of Technology; "Cleaning Equipment," by W. M. Smith.

The president of the company, W. M. Campbell, announced that over four million pounds of Magnus cleaners have been consumed by the various businesses the company serves.

MUSEUM OF INDUSTRY

The \$5,000,000 National Museum of Engineering and Industry, to be erected on the Smithsonian Institution grounds on The Mall as a companion building to the natural history museum and the gallery of the fine arts, the classic structures erected in harmony with the new plans of the Fine Arts Commission, designed to make Washington the world's most beautiful capital city. The

dustrial progress. It will be 1150 feet long, 250 feet deep and cover twenty-seven acres of floor space. The great central rotunda will house a Hall of Fame for eminent engineers, inventors and industrialists and a Founders' Room to commemorate those who will have contributed to the museum, in time, money or effort. A public building and endowment fund of 10,000,000



NATIONAL MUSEUM OF ENGINEERING AND INDUSTRY

new museum will house exhibits depicting the dramatic evolution of engineering and the industries and will be the first national institution in this country devoted exclusively to recording in-

is being raised from the present headquarters of the National Museum of Engineering and Industry in the Engineering Societies Building, 29 West 39th St., New York City.

PHILADELPHIA FOUNDRYMEN ELECT OFFICERS

Charles R. Spare metallurgical engineer, has been chosen to direct the activities of the Philadelphia Foundrymen's Association, Inc., as president, at the 34th annual meeting at Manufacturer's Club, January 14, 1925.

Mr. Spare is also the president of the American Manganese Bronze Company, with works at Holmesburg, a suburb of Philadelphia, one of the largest producers in the United States, of castings. The American Manganese Bronze Company made the major portion of bronze for the building of the Panama Canal also the largest bronze valves ever made for the Catskill Aqueduct.

Howard Evans was re-elected secretary for the thirty-fourth consecutive year. He is one of the directors of the old house of J. W. Paxson Company of Philadelphia, makers of foundry equipment and supplies. This house built the cupola melting plants for the Baldwin Locomotive Works, the Cramp Ship & Engine Building Company, the U. S. Navy Yard Foundry at League Island and the Pennsylvania Railroad Foundry at Altoona. They also installed the sand blast or dust collector outfits for the Buick, Dodge and Hudson Motors, the Victor Talking Machine Company, both the Willard and Electric Storage Battery Works, the Lawrence Portland Cement Company and others.

C. F. Hopkins, second vice-president, Ajax Metal Company, Philadelphia, Pa., was elected vice-president. **W. G. Summers**, assistant purchasing agent Phoenix Iron Company, was re-elected treasurer. The executive committee is as follows: **Walter Wood**, R. D. Wood & Company, **Frank Krug**, sales manager White & Brothers, Inc., **Theodore E. Brown**, president General Furnace Company, **Walter T. MacDonald**, purchasing agent Fletcher Works, Inc., **William S. Haney**, vice-president Penn Steel Castings and **J. Howard Sheeler**, president Sheeler-Hemsher Company. The membership committee is as follows: **R. R. Belleville**, Joseph Dixon Crucible Company, **H. M. Giles**, general superintendent South Works, Westinghouse Electric & Manufacturing Company, **W. L. Kalbach**, pattern maker, **J. F. High**, Air Reduction Sales Company, and **R. E. Blazo**, secretary Reed, Fears & Miller. The trustees are C. R. Spare, W. G. Summers, Howard Evans and Frederick M. Devlin.

The object of the Philadelphia Foundrymen's Association is

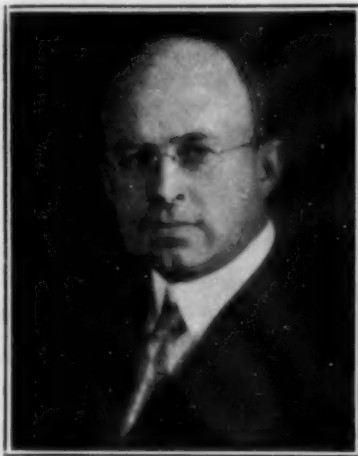
to bring together those engaged in the casting of metals and iron, and allied industries at dinner in a social way, the presentation of papers, talks, and pictures to show the latest development of interest to the foundry trade.

Mr. Spare said, "The great wave of optimism and increased confidence which is sweeping the country has resulted in increased industrial activity in all the metal trades. The heavy and sustained demand for copper and the other non-ferrous metals during December has continued into this year. The foreign situation has improved steadily while the domestic demand is very encouraging. Not only has consumption increased considerably in those fields in which copper, bronze and brass, have usually dominated, but extended uses for these alloys have been developed and researches

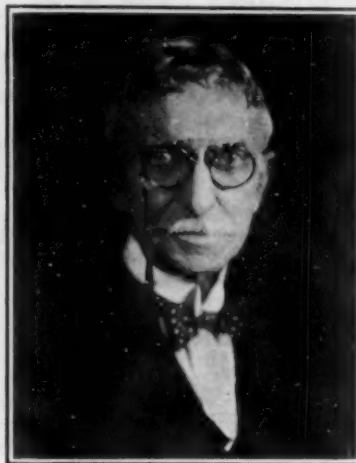
now under way are aiming at new applications for these metals. The year of 1925 bids to be a banner year for metals."

Mr. Evans said, "Among the many changes that have taken place since 1891, the use of structural and pressed steel, brass and concrete, has eliminated the use of castings to a large extent, particularly cast iron columns, store fronts, hardware, parts of locomotives, freight and passenger cars, special pieces of machinery and motors, etc. Castings made in permanent molds, the latest being cast iron water and gas pipe by centrifugal pouring all putting a crimp in the old way of casting in sand; but new fields have opened up to partly compensate.

"The wage of the molder and core maker has increased three or four times and the cost of raw material and transportation is higher. The iron castings that now sell at 6 to 10 cents per pound were only 1½ to 3 cents when the foundry association started. The art of molding has improved wonderfully; many large castings that were made in loam are now made in green sand and the molding machine with the squeeze or jolt ram has reached a high point of efficiency, these factors with the up-to-date electric crane and hoist have made great strides in reducing the cost of casting, much of which is brought about by the annual conventions of the American Foundrymen's Association and their exhibits showing the improvement each year since 1896 at Philadelphia, when this association was born.



CHARLES R. SPARE
President



HOWARD EVANS
Secretary

GAS COMPANIES BREAK RECORDS

The gas utilities of the United States sold 405 billion cubic feet of manufactured gas in 1924, according to figures made public by the American Gas Association. This is an increase of 20 billion cubic feet over 1923, and a six-year increase of 100 billion cubic feet. Steady expansion of plant and distribution facilities during 1924 enabled the companies to connect 440,000 new customers to their lines, making a total of 10,240,000 customers as of December 31, 1924, the association states. Total population served by gas is in the neighborhood of 52,000,000 people.

Unprecedented use of gas in industrial heating processes is chiefly responsible for the large increase in sales in recent years. During the last ten years the industrial use of gas jumped 1,000 per cent and indications are that 1925 will establish a new high record in consumption. The metal trades including metal melting, heat-treating, jappanning, etc., are responsible for a good share of this increase.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America...	\$100	\$490	\$520
American Hardware Corporation...	100	90	92
Anaconda Copper	50	43½	44
Bristol Brass	25	11	13
International Nickel, com.....	25	26	26½
International Nickel, pfd.....	100	96½	97½
International Silver, com.....	100	125	145
International Silver, pfd.....	100	107	110
National Enameling & Stamping...	100	34¾	35½
National Lead Company, com.....	100	156¾	158
National Lead Company, pfd.....	100	116½	117
New Jersey Zinc.....	100	192	195
Rome Brass & Copper.....	100	145	..
Scovill Manufacturing Company...	..	248	255
Yale & Towne Mfg. Company, new ..	..	68½	70½

Corrected by J. K. Rice, Jr., Co., 36 Wall street, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

For the past few months it has been apparent that there has been a return of confidence to a marked degree on the part of consumers and a general optimistic view as to the future. It was observed throughout the entire metal industry that this return in confidence resulted in the placing of a number of orders, and the advancing prices of copper and other commodities resulted.

There is, of course, at this time no way of telling whether there will be a realization of all the optimistic expectations. An inquiry among the more conservative elements of the trade, notably among those producing brass and copper fabricated materials in the form of wire, rod, sheet and tube, reveals the fact that although everyone feels that better times are ahead of us, at the same time no one is willing to predict that we will have a runaway market, or that there will be a general mushroom character to business. It is regarded as a fact that the next two or three years may be looked upon as having great possibilities for prosperity, but the largest factors in the industry are not willing to make any prophecies. They are content to do the day's work with a feeling that tomorrow will be another day, and when it comes, the work that it may bring will be done without any excitement.

One of the factors which is instrumental in tempering optimism with conservatism is the fact that the large operators realize that the country has such an enormous productive capacity as a result of war expansion, that it would take a huge amount of business to keep this capacity fully engaged over a long period. It is felt that the continued prosperity of the metal industry will depend to a very large degree, as is

natural, on the prosperity and stabilization of other manufacturing lines which are consumers of metals. There is nothing in this thought which should be other than reassuring, however, for the reason that most industries consuming brass and copper are seeing some daylight ahead, and a change in their position from the utmost depression to moderate activity gives rise to the belief that the whole business structure is righting itself and will shortly be back to normal.

All of the mills in the brass and copper line have had a very noticeable increase in the volume of orders that have been placed, and they are all running along now with a very comfortable order book which assures a full-time operation for several months ahead. The same situation exists in the nickel, nickel alloy and Monel metal business. These lines have all felt the impetus which has been given to general business by the apparent return of confidence, and fair sized orders have been placed. Many large consumers who were out of the market entirely during 1924 have come back with sizable contracts and orders, with the result that all of the mills producing this line of metal are comfortably situated. Many new developments which were opened up during the year have reached the point where experimental sample lots have been followed by orders for definite equipment.

It is felt through the entire metal industry that the view of conservative enthusiasm, which might be regarded as "tempered optimism," which is now general throughout the manufacturing world, will make for a steady growth of a healthy business, and that the year 1925 should be sufficiently prosperous to satisfy all.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

General market firmness was a feature in copper for a considerable part of the month of January. Transactions were in good volume both for domestic account and export, and the selling price advanced to 15 $\frac{3}{4}$ c @ 15 $\frac{3}{4}$ c for forward deliveries. During the second half of the month, however, an easier tone developed owing to resales of speculative holdings at concessions. Sales were made on the reaction at 14 $\frac{3}{4}$ c @ 14 $\frac{7}{8}$ c delivered in Connecticut Valley, with export business done at 14 $\frac{3}{4}$ c @ 14 $\frac{3}{4}$ c f.a.s. New York. There were rumors that pressure to sell resulted in even lower figures for a small tonnage.

Producers as a rule were not inclined to follow the prices fixed by the independent and outside holders. The market set-back, however, acted as a check on free buying by consumers which was so noticeable several weeks ago. New inquiries and orders were fewer, and for the time being the market is dull and easier. This may be only a temporary phase of the situation, but meanwhile buying is curtailed and the market is undergoing a test of strength and ability to allay any apprehension that may have arisen in the minds of consumers.

ZINC

The market for zinc has been steady recently but not remarkably active. Domestic demand is not particularly active as we close our report, but consuming needs are expected to be in good volume during the next few months. Foreign buying has been a sustaining factor in the situation. Deliveries have been heavily in excess of production for the last several months. American stocks were reduced nearly one-half in 1924, namely from 40,697 tons in January to 21,208 tons at end of year. Compared with surplus stocks last July, the present stocks, as per statistics on Dec. 31, 1924, are 31,497 tons smaller. The decrease in December alone amounted to 5,704 tons. Total production of domestic slab zinc in 1924 was 535,846 tons, against 531,202 tons in 1923. Market quotes about 8 cents for February delivery New York and 7.65 cents at East St. Louis.

TIN

Irregular market movements and frequent price fluctuations

lately give indication of a very sensitive situation in tin. This is not to be wondered at with prices nearly ten cents a pound higher than the average for January, 1924. The intrinsic position of tin may be defined as specially favorable to market firmness. However, while conceding the fact of statistical soundness, and the further fact of a healthy outlet for supplies, it is obviously natural that when prices approximate 60 cents a pound the response from the tin consuming industries will be one of prudent caution.

The release of pooled metal has disposed of stocks which exerted a decided speculative market influence. Trade requirements must henceforth look to the direct sources of production for the necessary supplies, and as recent consumption appeared to be well in excess of output the tin situation presents many possibilities for the year 1925. Arrivals of tin in this country Jan. 1 to 28 amounted to 8,620 tons, and in addition thereto there were 6,590 tons afloat.

LEAD

There was a decided downward tendency in market prices for lead during the last half of January. At the beginning of the year the price quoted by the leading producer was 9 $\frac{3}{4}$ c, New York, with the outside level for independent supplies quoting 10 $\frac{1}{4}$ c. For a time it looked as if higher prices were imperative, and in keeping with that tendency the American Smelting & Refining Company made four price advances within the first two weeks of January, lifting the contract basis a full half cent a pound to 10 $\frac{1}{2}$ cents New York on the 12th ultimo. The lead consumers, however, made no prodigious scramble to anticipate requirements on that announcement. In less than ten days the so-called official price was reversed and put back again to 10 cents. Heavy foreign selling and a sharp decline in London upset local calculations. The lead pyramid was getting top heavy and the builders had to stop and examine their blue prints. At present the market is steady, with buying on a moderate scale. On Jan. 29th the London market was £4 10s. per ton lower than on Jan. 13th. The domestic market quotes about 9 $\frac{3}{4}$ c St. Louis and 10c New York for February and March shipments. Consumption is large, but consumers are conservative at current prices.

ALUMINUM

Consuming demand continues to absorb aluminum on a large scale. Prices are consequently maintained without apparent difficulty on the basis of 28 cents virgin grade of 99% plus and 27 cents for 98-99% quality. The market displayed healthy activity in January, and domestic demand is such as to keep the product moving into consumption on a very substantial scale. The leading producer finds a ready outlet for a large tonnage. Importers are also well sold ahead.

ANTIMONY

There is a stringency in available supplies of antimony, and this fact tends to keep prices up to the present high level. Trade in the article is dull, but owing to the disturbed conditions in China and the firmness of sellers values are more or less nominal at 16¼ cents duty paid. Production has started up in Mexico, but the output capacity of that source is limited. A few shipments of the Mexican product have been made, but they are not important enough to affect the market very much.

QUICKSILVER

A more active inquiry for quicksilver has lifted prices to \$82.50 @ \$83 per flask. A year ago the market was depressed and prices down to a low ebb at about \$60 per flask. Recent strength is due to increased demand and possible new uses.

PLATINUM

Increased activity was also a feature in this market, but price of refined platinum remains practically unchanged at \$117 per ounce. There are rumors, however, that sales were made on the basis of \$113 to \$114 an ounce.

SILVER

The market for bar silver has been fairly steady lately. The price range in 1924 fluctuated between 62.8 the extreme low figure and 72.1 the high level for that period. Present domestic price is 69c @ 69¼c. The export movement of silver from this country last year rose to the impressive total of \$109,891,033. This was the largest export shipments since 1920 when the total outgo amounted to \$113,616,224. Imports of silver in 1924 were \$73,944,902. The excess exports amounted to \$35,946,131 in last year, and were the largest for any normal year.

OLD METALS

Strength was apparent in the market for scrap copper, old lead and brass alloys in the first half of January. The strong tone for the virgin metals gave an impetus to buying of scrap material. They began to weaken late in the month when lead and copper began to show declines. Concessions were necessary to secure business, but a rally in new metals would speedily be reflected among the scrap dealers. Buying prices are quoting 11½c @ 12c for heavy copper, 9¾c @ 10c for light copper, 7c @ 7½c for heavy brass, 6c @ 6¼c for light brass, 8¼c @ 8½c for heavy lead, 4c @ 4½c for old zinc scrap, and 21½c and @ 22c for aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1924, 13.419—January, 1925, 15.125.

Brass Mill Zinc—Average for 1924, 7.10—January, 1925, 8.60.

Daily Metal Prices for the Month of January, 1925

Records of Daily, Highest, Lowest and Average

	*1	2	5	6	7	8	9	12	12	14	15	16	19
Copper (f. o. b. Ref.) c/lb. Duty Free.....													
Lake (Delivered)	15.125	15.25	15.25	15.25	15.125	15.125	15.25	15.25	15.25	15.25	15.25	15.25	15.25
Electrolytic	14.85	15.00	14.95	14.95	14.875	14.875	15.10	15.00	14.90	14.90	14.85	14.85	14.85
Casting	14.375	14.50	14.50	14.50	14.375	14.375	14.625	14.625	14.50	14.50	14.375	14.375	14.375
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.....													
Prime Western	7.85	7.85	7.85	7.825	7.80	7.85	7.90	7.90	7.95	7.90	7.80	7.825	7.825
Brass Special	7.90	7.90	7.90	7.875	7.85	7.90	7.95	7.925	8.00	8.00	7.90	7.90	7.90
Tin (f. o. b. N. Y.) c/lb. Duty Free.....													
Straits	59.875	60.50	60.00	60.125	59.50	59.50	59.50	58.75	58.50	58.25	57.00	57.00	57.00
Pig 99%	59.125	59.875	59.375	59.50	59.00	59.00	59.00	58.125	58.00	57.75	56.50	56.50	56.50
Lead (f. o. b. St. L.) c/lb. Duty 2¼c/lb.....	10.20	10.35	10.30	10.30	10.30	10.40	10.55	10.70	10.75	10.75	10.70	10.70	10.50
Aluminum c/lb. Duty 5c/lb.	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Nickel c/lb. Duty 3c/lb.													
Ingot	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00
Shot	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00
Electrolytic	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
Antimony (J. & Ch.) c/lb. Duty 2c/lb.....	18.00	18.00	18.00	18.25	17.75	17.75	17.50	17.75	17.75	17.50	17.375	17.375	17.375
Silver c/oz. Troy Duty Free	67.00	68.50	68.50	67.75	67.875	68.50	69.375	68.75	68.50	68.50	68.125	68.375	68.375
Platinum \$/oz. Troy Duty Free	117	117	117	117	117	117	117	117	117	117	117	117	117
	20	21	22	23	26	27	28	29	30	High	Low	Aver.	
Copper (f. o. b. Ref.) c/lb. Duty Free.....													
Lake (Delivered)	15.25	15.125	15.125	15.125	15.125	15.125	15.125	15.125	15.125	15.25	15.125	15.185	15.185
Electrolytic	14.80	14.70	14.70	14.80	14.80	14.75	14.70	14.70	14.65	15.10	14.65	14.843	14.843
Casting	14.375	14.25	14.25	14.375	14.375	14.25	14.25	14.25	14.25	14.625	14.25	14.393	14.393
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.....													
Prime Western	7.775	7.65	7.65	7.625	7.65	7.65	7.65	7.65	7.55	7.95	7.55	7.769	7.769
Brass Special	7.875	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.60	8.00	7.60	7.827	7.827
Tin (f. o. b. N. Y.) c/lb. Duty Free.....													
Straits	56.00	56.00	56.50	57.625	57.75	57.25	57.875	58.00	57.375	60.50	56.00	58.232	58.232
Pig 99%	55.50	55.50	56.125	57.125	57.25	56.75	57.375	57.50	56.875	59.875	55.50	57.702	57.702
Lead (f. o. b. St. L.) c/lb. Duty 2¼c/lb.....	10.375	9.75	9.75	9.75	9.75	9.75	9.75	9.75	9.60	10.75	9.60	10.213	10.213
Aluminum c/lb. Duty 5c/lb.	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00	28.00
Nickel c/lb. Duty 3c/lb.													
Ingot	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00	31.00
Shot	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00	32.00
Electrolytic	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
Antimony (J. & Ch.) c/lb. Duty 2c/lb.....	17.00	16.75	16.75	16.75	16.75	16.75	16.75	16.75	16.875	18.25	16.75	17.339	17.339
Silver c/oz. Troy Duty Free	68.375	68.625	68.50	68.25	68.75	68.375	68.75	68.125	68.875	69.375	67.00	68.399	68.399
Platinum \$/oz. Troy Duty Free	117	117	117	117	117	117	117	117	117	117	117	117	117

*Holiday.

Metal Prices for February 9, 1925

Copper: Lake, 15.125. Electrolytic, 14.80. Casting, 14.375.
Zinc: Prime Western, 7.625. Brass Special, 7.675.
Tin: Straits, 56.875. Pig, 99%, 56.375.
Lead: 9.60. Aluminum, 28.00. Antimony, 20.00.

Nickel: Ingot, 31.00. Shot, 32.00. Electrolytic, International Nickel Company, 38.00.
Quicksilver, flask, 75 lbs., \$80.00. Silver, oz. Troy, 68.50.
Platinum, oz. Troy, \$117. Gold, oz. Troy, \$20.67.

Metal Prices, February 9, 1925

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	11½ to 12½
Brass Ingots, Red	12½ to 14
Bronze Ingots	12 to 13
Bismuth	\$1.30 to \$1.35
Cadmium	50
Casting Aluminum Alloys	21 to 24
Cobalt—97% pure	\$2.50 to \$2.75
Manganese Bronze Castings	23 to 40
Manganese Bronze Ingots	13 to 16½
Manganese Bronze Forging	34 to 44
Manganese Copper, 30%	28 to 45
Parsons Manganese Bronze Ingots	18½ to 19½
Phosphor Bronze	24 to 30
Phosphor Copper, guaranteed 15%	19½ to 21
Phosphor Copper, guaranteed 10%	18½ to 20
Phosphor Tin, guaranteed 5%	65 to 70
Phosphor Tin, no guarantee	65 to 75
Silicon Copper, 10%	28 to 35
.....according to quantity	

OLD METALS

Buying Prices		Selling Prices	
12½ to 12½	Heavy Cut Copper	13½ to 13½	
12 to 12½	Copper Wire	13 to 13½	
10½ to 10½	Light Copper	11½ to 12	
9½ to 9½	Heavy Machine Comp.	10½ to 11½	
7½ to 8	Heavy Brass	8½ to 9½	
6½ to 7	Light Brass	8 to 8½	
8½ to 8½	No. 1 Yellow Brass Turnings	9½ to 10	
8½ to 9	No. 1 Comp. Turnings	10 to 10½	
8 to 8½	Heavy Lead	8½ to 9	
4½ to 5	Zinc Scrap	5½ to 6	
10	Scrap Aluminum Turnings	12 to 14	
16 to 17	Scrap Aluminum, cast alloyed	18 to 19	
20	Scrap Aluminum, sheet (new)	23 to 25	
32	No. 1 Pewter	36 to 38	
12	Old Nickel anodes	14	
18	Old Nickel	20	

BRASS MATERIAL—MILL SHIPMENTS

In effect Jan. 13, 1925

To customers who buy 5,000 lbs. or more in one order.

Net base per lb.

	High Brass	Low Brass	Bronze
Sheet	\$0.19½	\$0.21½	\$0.23½
Wire .....	.20½	.21½	.23½
Rod .....	.17½	.22½	.24½
Brazed tubing .....	.27½	.....	.33½
Open seam tubing .....	.27½	.....	.33½
Angles and channels .....	.30½	.....	.36½

To customers who buy less than 5,000 lbs. in one order.

Net base per lb.

	High Brass	Low Brass	Bronze
Sheet	\$0.20½	\$0.22½	\$0.24½
Wire .....	.21½	.22½	.24½
Rod .....	.18½	.23½	.25½
Brazed tubing .....	.28½	.....	.34½
Open seam tubing .....	.28½	.....	.34½
Angles and channels .....	.31½	.....	.37½

SEAMLESS TUBING

Brass, 24½c. to 25½c. net base.
 Copper, 25½c. to 26½c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	21½c. net base
Muntz or Yellow Metal Sheathing (14"x48")	19½c. net base
Muntz or Yellow Rectangular Sheet other Sheathing	20½c. net base

Muntz or Yellow Metal Rod 17½c. net base |

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled) 22c. to 24½c. net base |

From stock 23c. to 25 c. net base |

BARE COPPER WIRE—CARLOAD LOTS

17½c. to 17½c. net base.

SOLDERING COPPERS

300 lbs. and over in one order 22 c. net base |

100 lbs. to 200 lbs. in one order 22½c. net base |

ZINC SHEET

Duty, sheet, 15% Cents per lb. |

Carload lots, standard sizes and gauges, at mill,
 less 8 per cent discount 11.00 basis |

Casks, jobbers' price 12.25 net base |

Open Casks, jobbers' price 12.75 to 13.00 net base |

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price 40c. |

Aluminum coils, 24 ga., base price 36.70c. |

Foreign 40c. |

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	27½c.
15% "	28½c.
18% "	29½c.

Nickel Silver Wire and Rod

10% "	30½c.
15% "	34½c.
18% "	37½c.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	48
Hot Rolled Sheets (base)	42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 71½c. to 73½c. per Troy ounce, depending upon quantity.
 Rolled sterling silver 68½c. to 70½c.

NICKEL ANODES

90 to 92% purity	43 c.-45 c. per lb.
95 to 97% purity	45 c.-47 c. per lb.

Supply Prices, February 9, 1925

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	10-14
Acid—		
Boric (Boracic) Crystals.....	lb.	.12
Hydrochloric (Muriatic) Tech., 20°, Carboys.....	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys.....	lb.	.06
Hydrofluoric, 30%, bbls.....	lb.	.08
Nitric, 36 deg., Carboys.....	lb.	.06
Nitric, 42 deg., Carboys.....	lb.	.07
Sulphuric, 66 deg., Carboys.....	lb.	.02
Alcohol—		
Butyl	lb.	.27-.32
Denatured in bbls.....	gal.	.60-.62
Alum—		
Lump Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech.....	lb.	.02½
Aluminum chloride solution in carboys.....	lb.	.06½
Ammonium—		
Sulphate, tech., bbls.....	lb.	.03¾
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar.....	lb.	.27
Arsenic, white, kegs.....	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.....		
Borax Crystals (Sodium Biborate), bbls.....	lb.	.05½
Calcium Carbonate (Precipitated Chalk).....	lb.	.04
Carbon Bisulphide, Drums.....	lb.	.06
Chrome Green, bbls.....	lb.	.36
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, bbls.....	lb.	.17
Cyanide	lb.	.50
Sulphate, bbls.....	lb.	.05½
Copperas (Iron Sulphate, bbl.)	lb.	.01½
Corrosive Sublimate, see Mercury Bichloride.....		
Cream of Tartar Crystals (Potassium bitartrate).....	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	\$30.00
Fluor-spar (Calcic fluoride).....	ton	\$75.00
Fusel Oil	gal.	\$4.50
Gold Chloride	oz.	\$14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron, Sulphate, see Copperas, bbl.....	lb.	.02
Lead Acetate (Sugar of Lead).....	lb.	.13
Yellow Oxide (Litharge).....	lb.	.12½
Mercury Bichloride (Corrosive Sublimate).....	lb.	\$1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22½
Salts, single bbls.....	lb.	.10½
Salts, double bbl.	lb.	.10
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity.....		.35-.40
Potash, Caustic Electrolytic 88-92% fused, drums.....	lb.	.08¾
Potassium Bichromate, casks.....	lb.	.08¾
Carbonate, 80-85%, casks.....	lb.	.05¾
Cyanide, 165 lb. cases, 94-96%.....	lb.	.60

Pumice, ground, bbls.....	lb.	.02½
Quartz, powdered	ton	\$30.00
Rosin, bbls.....	lb.	.03
Rouge, nickel, 100 lb. lots.....	lb.	.25
Silver and Gold.....	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks.....	lb.	.08
Silver Chloride, dry.....	oz.	.86
Cyanide (Fluctuating Price).....	oz.	.70
Nitrate, 100 ounces lots	oz.	.48
Soda Ash, 58%, bbls.....	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls.....	lb.	.05½
Cyanide, 96 to 98%, 100 lbs.....	lb.	.70
Hyposulphite, kegs.....	lb.	.04
Nitrate, tech., bbls.....	lb.	.04¾
Phosphate, tech., bbls.....	lb.	.03½
Silicate (Water Glass), bbls.....	lb.	.02
Sulpho Cyanide.....	lb.	.45
Soot, Calcined.....	lb.	—
Sugar of Lead, see Lead Acetate.....	lb.	.13
Sulphur (Brimstone), bbls.....	lb.	.02
Tin Chloride, 100 lb. kegs.....	lb.	.41
Tripoli, Powdered.....	lb.	.03
Verdigris, see Copper Acetate.....	lb.	.37
Water Glass, see Sodium Silicate, bbls.....	lb.	.02
Wax—		
Bees, white ref. bleached.....	lb.	.55
Yellow, No. 1.....	lb.	.35
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.....	lb.	.13-.17
Chloride, 600 lb. lots.....	lb.	—
Cyanide	lb.	.41
Sulphate, bbls.....	lb.	.03¾

COTTON BUFFS

Open buffs, per 100 sections (nominal),			
12 inch, 20 ply, 64/68, unbleached sheeting..base,	\$32.40-\$40.85		
14 inch, 20 ply, 80/96, " " ..base,	45.25- 50.80		
12 inch, 20 ply, 80/96, " " ..base,	47.35- 46.20		
14 inch, 20 ply, 84/92, " " ..base,	63.15- 62.25		
12 inch, 20 ply, 88/96, " " ..base,	63.25		
14 inch, 20 ply, 88/96, " " ..base,	85.15		
12 inch, 20 ply, 80/96, " " ..base,	52.70		
14 inch, 20 ply, 80/96, " " ..base,	70.80		
Sewed Buffs, per lb., bleached and unbleached..base, .55 to .75			

FELT WHEELS

Diameter—10" to 16"	1" to 3"	Price Per Lb.	300 Lbs. and Over
		Less Than 100 Lbs.	
" 6" 8" and over 16"	1" to 3"	\$3.00	\$2.65
" 6" to 24"	1" to 3"	3.10	2.75
" 6" to 24"	Over 3"	3.40	3.05
" 4" to 6"	½" to 1"	4.00	3.65
" Under 4"	¼" to 3"	4.85 }	Any quantity
	¼" to 3"	5.45 }	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above.

FELT WHEELS

	6" to 18"	Over 18"	Under 6"
Over 3"	\$3.00	\$3.30	\$3.75
1" to 3"	2.50	2.70	3.75
Under 1"	3.30	3.60	3.75
25 to 99 pounds..... 15c. per lb. discount			
100 pounds and over..... 30c. per lb. discount			
Odd Size Diameter—25c. per lb. advance.			